PLASTIC SURGERY OF THE NOSE

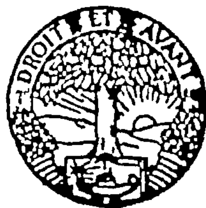
PLASTIC SURGERY OF THE NOSE

BY

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This Book is Dedicated to My Son

BENJAMIN PINCUS SELTZER

Preface

This book has been prepared as a practical guide in rhinoplasty, and is based on years of observation, practical application and experience.

It has been the writer's intent to present clearly the procedures that have been used successfully by many of his colleagues and by himself. This plan has been carried out by means of the statement of underlying principles of modern nasal surgery and by many illustrations of technical processes.

There has been a considerable growth of surgery in the field of plastic operations on the nose in recent times. To meet the demand, attention should be paid to the training of more and better fitted specialists for this purpose.

It is the purpose of the book to present a practical application of the co-ordinated knowledge of anatomy, physiology and surgery.

In preparing a book, one necessarily is under obligation to all those who have contributed to the subject. The writer wishes particularly to acknowledge the interest, the encouragement and the assistance of Dr. George Morrison Coates, professor of otolaryngology in the Graduate School of Medicine of the University of Pennsylvania. It was he who made it possible for the writer to progress in this field of surgery. He also has contributed largely to the training generally of specialists in the field of diseases of the ear, the nose and the throat. Acknowledgment of assistance given is made to Elizabeth B. Minter for her excellent original illustrations, to Alfred Feinberg for the seven original color plates, and to the staff of J. B. Lippincott Company for their patience and for their thoroughness as publishers. The writer also wishes to acknowledge his indebtedness to the many surgeons, both at home and abroad, whose technics he has observed and whose writings he has consulted. He is especially grateful to his wife for her continued encouragement and inspiration.

A. P. S.

Contents

PLASTIC SURGERY OF THE NOSE

1

History

The first interesting fact concerning the practice of plastic surgery is its antiquity One reads that in the beginning it appeared by revelation from Brahma about 4000 B C It is also said to have existed from time immemorial Its earlier application was confined in large part to the nose

The word itself—nose—has the same stem in all known European tongues This has been considered evidence that the word was transmitted directly from the ancient Sanskrit to modern languages

As an organ, the nose has been outstanding figuratively as well as literally from earliest times According to the Japanese story of the Creation, one of the first gods to appear upon the earth was the Sky Father, who dipped his jeweled sword in the sea and allowed the drops of water to fall back, thus forming the Japanese archipelago Then he bathed his *nose* in the sea that washed Japan, and thus the Storm God was born In contrast with this colorful tale, one reads among folklore that a cold could be cured by kissing the nostrils of a mule

The importance of the nose in symbolism is further illustrated by its use in Egyptian hieroglyphs to designate Man

The size and the contour of the nose have been held to be trustworthy indicators of personal characteristics Napoleon Bonaparte always chose men with large noses for important missions Pascal, who lived from 1623 to 1662, wrote of Cleopatra's nose "If the nose of Cleopatra had been shorter, the whole face of the earth would have been changed" And Rostand (1868-1918) has Cyrano say

> A great nose indicates a great man—
> Genial, courteous, intellectual,
> Virile, courageous

This viewpoint is apparently not acceptable to Tahitians, who consider it an insult to be called long-nosed.

A flat nose was an object of prejudice among the patriarchs of Biblical times (Leviticus 21 18) though later in the time of Attila, about the middle of the fifth century it was the practice of the Huns and of certain other peoples to flatten the noses of babies by bandaging

Shakespeare assigns the nose a role of practical significance in King Lear

> Thou canst tell why one s nose stands i' the middle on s face?
> Why to keep one s eyes of either side.

The widespread use of the nose in salutation in certain parts of the world is seen in the custom of rubbing noses Darwin observed this practice in New Zealand and Linnaeus found it among the Lapps It is said to be a practice also in Malaya Indo-China and Burma and among the Eskimos What is called rubbing noses is described by observers as a salute by smelling or sniffing This form of greeting may be a variant of that of blowing in one another s ears which was seen by Charlevoix (1682 1761) among Indian tribes of the Gulf of Mexico and later by Du Chaillu among the natives of equatorial Africa.

The earliest records of rhinoplasty indicate that it was in common practice in Egypt and in India between 2500 and 600 B C. At that time operations on the nose are said to have been done by potters and brickmakers This fact is explained by the peculiarities of the Indian caste system through which men of ability were not necessarily of high caste (One need only think that it was in comparatively recent times that surgery in the Western world was the practice of barbers) Plastic repair then was limited chiefly to restoration of the nose and the lips. This situation arose from the custom of the semibarbarous peoples of amputating the nose and the lips not only of prisoners of war but of civil delinquents. Since the executioners made a practice of throwing the amputated fragments into the fire to prevent their being replaced promptly by their owners artificial repair was necessary It is related that at one time the noses of all the inhabitants—men women and children—of a city in Nepal were removed by the conquering king of Ghoorka Many committed suicide. A similar destructive act was committed later in Ceylon.

The most fully recorded work in plastic surgery during this time is that of Susruta in India. According to the description of his

method, in his Ayur-Veda (the Science of Life), he took the leaf of a tree and from it cut a pattern for size and outline of the part of the nose that was lacking. This pattern was laid on the forehead or the cheek and the underlying skin was dissected free and placed on the stump of the nose, which had been prepared by scarification. If the new nose proved to be too large, or too small, it was cut off and the operation was repeated. It took usually an hour and a half to perform each operation. Susruta possessed 125 different instruments, made in the shapes of beasts and birds. His method is used today, with certain modifications, and continues to be called the Indian method. An attempt has been made to show that Hindu writings on this subject are recent, and that the name Susruta is a Hindu corruption of Hippocrates. However, this idea has not met with acceptance. From India, this surgical practice extended to Persia, to Arabia, and then to Greece and Italy.

The first records of plastic surgery in Europe appear early in the first century A.D. They are concerned with the work of Celsus (53 B.C. - A.D. 7), who was credited with having originated the methods described by him. Then follow similar accounts of the work of Galen (A.D. 132-210).

Of the anatomy of the nose, Galen wrote:

> The nose has a septum in the middle and hence two important channels, one in each nostril, and each of these is further divided into two higher. One of these divisions goes backward to the mouth and the other mounting to the brain itself. The brain has two outgrowths elongated and hollow, having their beginnings from the anterior ventricles coming down to that part of the cranium where the nose begins. Here is the seat of the sieve-like bones, the use of which the name sufficiently indicates, and the dura overspreading these bones is pierced with minute holes. Through this filters the thicker part of the superfluities of the brain. The thick discharges such as those in acute and chronic catarrh are carried down, first passing through the dura mater, after that, through the ethmoids and then evacuated into the channel of the nose.

These theories survived well into the seventeenth century. It was only at the end of the eighteenth that the study of the olfactory system became more scientific and it was shown that the nasal fossae did not communicate with the brain cavities.

One of the definite later records of the seventh century is an account of the restoration of his nose that had been lost in battle by the Emperor Justinian II.

There was a period from 1295 to 1360 when the practice of plastic surgery seemed to lapse It was restored to favor only in the fifteenth century

In 1442 the Brancas (father and son) of Catania introduced the Indian method of rhinoplasty into Europe These surgeons are credited with the first use of a graft from the arm The work of the Brancas was followed by the more widely famous work of Taglia cozzi (1546-1599) who also has been said to have originated the arm-graft method of rebuilding the nose. In a book written by him at this time he illustrated how his method of operation resembled that of tree grafting

Tagliacozzi s method involved a very lengthy operation in six stages His work brought him widespread fame and people went to him from all parts of Europe for operations. Not only did patients seek him out but students went from a distance to learn his meth ods A statue in commemoration of his skill was placed in the anatomic theater of the University of Bologna. This shows him holding out a nose

The publicity concerning skin grafting during this time was such that charlatans joined children s bodies together and exhibited them for money However the time came when plastic surgery was prohibited by the Church and it is said that it was opposed also by such men in medicine as Paré (1517 1590) and Fallopius (1523-1562) although one finds that Paré devised an operative method of his own for repairing the nose By it a cavity was made in a biceps muscle and into this the stump of the scarified nose was firmly bound When the two surfaces were well joined together a new contour of the nose was cut from the arm muscle

In 1788 the Paris faculty interdicted face repairing altogether thus helping it to fall into disrepute At that time this type of surgery was unpopular also in England where it was strongly opposed and open to such ridicule that Butler included a taunting reference to it in his Hudibras

Even after Carpue (1764-1846) had proven successfully the Italian method of plastic surgery many British physicians looked with contempt upon his work In 1794 his success gained in inter est after an illustrated article appeared in the Gentleman s Maga zine This described the case of a bullock driver of the British Army in India who had lost his nose and gave details of the method

by which it had been successfully reconstructed. Carpue's work had already attracted the notice of King George IV, and in this way plastic surgery was restored to the general field of surgery About this time also the art was introduced into Germany by von Graefe (1815) and further by the work of Dieffenbach (1829), into France by LisFranc (1826), and then into America by Warren (1837), followed by Roe, Smith, Monks, Goodale and others It is said that many who had been banished from society because of nasal mutilation were then restored to normal living following reparative treatment

That plastic surgery received wider application has been credited to von Graefe (1787-1840), who is said to have devised the operation for cleft palate (1816) Other names soon to appear were Reverdin (1870), Ollier (1872) and Thiersch (1874), who made important contributions to the technic of skin grafting Ingals corrected deflection of the nasal septum by partial excision (1882) This operation was later perfected by Krieg (1899), by Freer (1902) and by Killian (1904), the last named also being the first in 1903 to operate for inflammation of the frontal sinus

During World War I a special division of maxillofacial surgery was organized by the Medical Department of the United States Army and a similar organization was established in Britain A few prominent names in war surgery then were Gillies, Carter, Blair, Davenport, Thomson, Zimmermann, Sebileau and Caboche It should also be borne in mind that there were many busy war surgeons who contributed to this field but did not have leisure to prepare papers

A critical review of the surgery of the nose and the face during World War II emphasizes the impression that the impetus given was largely due to the enormous number of operations and the broadening of the general field rather than to the initiation of special operative methods or instruments This viewpoint is well illustrated by the experience of Morestin (1869-1919), whose name is outstanding Hippolyte Morestin began his professional career as a general surgeon, it was only later that he entered the field of maxillofacial surgery From 1914 to 1917 he wrote eight articles on the nose In these he specified the use of the Indian methods (2500-600 B C) and the Italian modes of operating (sixteenth century)

Lexer (1929), known earlier as an orthopedic surgeon, also approved the Italian method when he undertook surgery of the face and

the nose He expressed his belief in a technic as simple as possible he did not favor the intranasal route or the use of many specialized instruments His opinions had the support of Miller (1924) who pertinently reminds claimants to originality that they are only adapting to particular regions the well known principles of plastic surgery

Eitner (1932) also has expressed lack of preference for the endonasal method of operations on the nose

Joseph acknowledged by many to be the Father of modern cosmetic surgery made many modifications in methods and devised apparatus that he used with skill and success

Esser (1918) did restorative operations upon the nose by rotation of a skin graft from the cheek called the French method of Serre and Nelaton (1807 1873) However this method does not have the approval of all other surgeons

It has been possible to record here the names of only a few of those who have contributed to the development of plastic surgery and many are still carrying on the work.

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The Nose and the Fine Arts

Art expresses the idea of being different from nature. This meaning appears clearly in the world artificial or a product of the skill of man Thus objects of the fine arts intended to appeal to the sense of beauty are represented by paintings and sculptures The intent is to realize ideality as contrasted with reality

But the idea of beauty is a relative one The concept of facial beauty among the aborigines of Africa and the natives of Polynesia must be quite different from that depicted by Greek art, as in the Venus de Milo generally considered to be the ideal of Occidental beauty

Among rhinoplastic surgeons there is a healthy difference of opinion concerning the desirability of following closely the dictates of the fine arts. While recognizing the importance of the nose as a prominent facial feature Barsky considers that there is no point in using precise measurements for the nose since the other lines of the face are not perfect and the face as a whole is not entirely regular So it is more important that the surgeon should seek to create a harmonious relationship between the nose and the other features of the face rather than follow blindly any prescribed ideal measurements.

Lexer s view is similarly broad He is also of the opinion that any cosmetic operation on the face or the nose should be undertaken only by one with both surgical ability and feeling for form and that only general technical rules need be considered that it is desirable to operate if possible with the patient in the sitting position similar to that of the model of the sculptor with the form and the outline of the face visible from all sides

Joseph who made such a great contribution to cosmetic surgery says.

He who will do facial plastic surgery cannot stop with operating under general surgical rules. He must also be something of an artist,

particularly a sculptor He must have a sense of harmony or an eye to proper proportions of the face This sense was always cultivated by recognized masters of art

The measurement that he has recorded is that the length of the face is equal to one-eighth of the total body length

According to the Berlin sculptor, Schadow, the ideal measurements for the face are obtained by dividing the part of the face between eyebrows and chin by six equidistant horizontal lines. The nose represents four units, the upper lip, one unit, the chin, two units Thus the length of the nose is half the length of the face The distance of the projection of the nose from the face equals one unit

According to the rules followed by Durer, the inner canthus of the eye and the lateral surface of the nasal ala are in a direct line

Joseph's three components of the facial profile are

1 The nasal bone (from the root of the nose to the lower border of the nasal bone).

2 The septal cartilage (from the lower border of the nasal bones to the most anterior point of the lateral nasal cartilage)

3 The apical cartilage (represented by the anterior parts of the lower or alar cartilages)

A profile is considered normal when the three profile components as a whole and in relation to each other are not conspicuously disproportionate in length The fact that a nose is straight does not necessarily mean that it is normal, since the nasofacial angle may be too acute or too wide open

Joseph's keen artistic interest led him to have an accurate study of the profile angle (nasofacial) made by measurements of a large number of portraits and marbles of the last 500 years It was found that the ancient Egyptian and Greek measurements of the profile angle, which is found by erecting a line extending from the root of the nose through the most anterior point of the chin and a line from the same point on the root of the nose along its anterior border (dorsum), both differed from modern ones This esthetic angle, in statues of both Greek gods and human figures, lies between 18 and 30 degrees, of Venus de Milo, 30 In Holbein's paintings of other than character heads, the average is 30 degrees Some of da Vinci's are only 20 degrees, many are 27, and the greater number are 30 It is noteworthy that in these paintings

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made from life there is a wide departure from those that are imaginary In the paintings of Reynolds and of Gainsborough the average is 30 degrees. In one collection of portraits from the latter part of the eighteenth century a change in the concept of beauty is indicated by higher figures from 32 to 40 although in other portraits at about the same time (by von Lenbach and Feuerbach) the average is 30

In Joseph's experience the Greek type of nose is the one most often requested when the correction of an unusual nose is desired. There are difficulties in this situation The typical Greek profile supposes a straight nose with a forehead retreating in a direct line therewith In the Roman profile there is not only a convexity in the upper part of the nasal dorsum but a more or less marked depression at the frontonasal junction and the line of the forehead tends to be perpendicular To create a Greek profile is possible given a Roman nose and a retreating forehead but to secure this result with a convex nose and a perpendicular forehead line is not only impossible the result is altogether unharmonious and may consequently be actually ugly

In the cosmetic as contrasted with the restorative operation the choice of the nasal profile must be decided in some degree by the patient. However in performing the operation it has been found useful to be guided by certain general rules of proportion Such measurements customarily found suitable are

1 The profile nasal angle (nasofacial) should lie between 25 and 35 degrees.

2 The forehead the nose and the distance from the junction of the nose and the lower lip should be of equal length or vary from this relation only slightly

3 The distance between the root and the base of the nose should be about the same length as that of the ears

4 If an angle is constructed by lines drawn between the outer angle of the palpebral fissures and the tip of the nose, a horizontal line joining the upper extremities of these lines should be equal in length to a vertical line drawn from the root of the nose to the tip of the chin

In general the length of the nose should not be greater than that from the nasolabial junction to the tip of the chin shorter rather than longer is preferable

If it is true, as is said, that no two natural noses are ever entirely alike, then small variations even in cosmetic operations are of relatively little importance. But all plastic surgeons agree that the operation must secure harmony of facial features.

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3

The Nose in Physical Anthropology

The ontogenetic development of the nose is said to be a repetition of its phylogenetic development.

The mudfish is the first possessor of olfactory organs that serve both for olfaction and respiration. At this phylogenetic level an open passage appears between the nasal pits (which represent the olfactory organ in fish in general) and the front of the roof of the mouth. This connection between the earlier nasal pits and the mouth is followed in the higher amphibia by the inclusion of the nasal organ within the skull and the differentiation of respiratory and olfactory parts. There is also an associated beginning of turbinal ingrowth. The accessory sinuses are first present in crocodiles, where they extend into the bones of the skull. Most mammals are macrosmatic, having a large area of olfactory mucous membrane in contrast with the primates, which are microsmatic. This condition is especially characteristic of man.

Man has been classified racially in many ways. Ethnic groups have been studied on the basis not only of physical characteristics but of language, religion, social institutions and otherwise.

Huxley's classification is made in consideration of skin color: Caucasian or white, Mongolian or yellow and red, and Negro or black. Groups according to hair character also have been determined. These include straight, wavy and curly hair. In addition to these criteria, the nose has been found in its variety and fixity to be one of the best characteristics for distinguishing races.

Deniker wrote:

> Differences between races are shown in the somatologic characteristics which are the resultant of the continual struggle in the individual of two factors: variability, or the production of the dissimilar, and heredity, the perpetuation of the similar.

According to Broca, the form of the nasal opening appears to be transmitted very tenaciously by heredity. This statement evidently refers to the pyriform opening rather than to the nares.

Noses are classified for racial significance as leptorhine, or long and thin, platyrhine, or flat, and mesorhine, an intermediate form These relations are expressed by the nasal index that results from the formula

$$\frac{\text{Greatest breadth} \times 100}{\text{Greatest length}}$$

In general, the length of the nose corresponds directly with the height of the whole face Also in general, the long, narrow type of nose is represented by the white races, whose nasal index averages less than 70, the intermediate type, by the yellow and the red races, with a nasal index of from 70 to 84 9, and the flat, broad type, by the black races, with a nasal index between 85 and 99 9. A small group of ultraplatyrhines with a nasal index over 100 is recognized by some authorities

The long nose usually has a straight or convex profile, with a straight, comparatively pointed tip This type has been found to prevail among those of European descent, also among Eurasians, Armenians, Caucasians and Eurafricans The profile of the intermediate group varies widely and is represented racially by Mongols, some of the populations of India and some Amerinds The flat-nosed profile is concave, with the tip broad and turned upward it is seen in those descended from the black populations of Africa, Oceania and India

All these classifications have many exceptions because of the complexity of variations that occur Bertillon recorded more than fifteen varieties of nose forms

These nasal relations have been expressed geographically by the observations that the nasal index is greatest, with few exceptions, at the equator, and that this figure decreases in proportion to the distance away from it

Although the United States has been called the melting pot of peoples, writers have spoken also of Europe as offering the greatest interblending, since, before the dawn of history, "a perpetual eddying" has taken place with the consequent intermixture of races

Schultz has reported finding a definite racial difference in the lateral nasal cartilages that is especially notable between whites and Negroes In whites, the cartilage presents a quadrangular form, usually a trapezium, while in Negroes it is triangular This cartilage also was found to vary greatly in size in both races, from being

so small as to be rudimentary to being so large as to extend to the maxillary border of the pyriform opening However in general these cartilages are somewhat smaller in the Negro than in the white As a rule all the nasal cartilages were found to be better developed in whites than in Negroes

A racial difference was also observed in the great alar cartilage in that the lower border of the lateral crus in whites runs for a con siderable distance parallel to the lower border of the medial crus and lies only slightly higher In Negroes the lower border of the lateral crus is much higher than the medial and the lateral border often bends sharply upward and backward

In Japanese people Virchow found that the lower border of the lateral limb of the great alar cartilage turned immediately upward. There was also a great variation in size of the cartilages in the Japanese

The form and the profile of the nose depend upon both the bony and the cartilaginous frameworks and upon the overlying muscles and the integument. All these elements vary in size and in shape and many may be entirely lacking It is of interest that regardless of their great potential variability there are influences tending to create types of nasal form and line that can be recognized as char acteristic not only of races but of peoples In considering the latter one associates the Scandinavian peoples with a relatively long thin straight nose The Scottish Highlanders and some English groups have similar characteristics of nose form Among the members of this general group the nose may be long and thin but instead of having a straight dorsal line there is a slight angularity at the junction of the nasal bones with the lateral cartilages that creates a convexity of the dorsum and thus produces the characteristic aquiline profile

Varying somewhat from this type of nose is the Semitic group which includes Jews Syrians Arabs gypsies and some unclassified peoples The characteristic type of nose is long and more or less thin, but with a more convex profile This convex line is produced by an additional angle to that which determines the aquiline nose — one at the lower border of the lateral nasal cartilage — which increases the convexity of the profile and causes the nasal tip to be depressed.

In sharp contrast with this type of nasal profile is that peculiar to

most of the black peoples and seen familiarly in the Negro Among these races the nose is low and broad and concave in profile

Less contrasting is the Mongolian type, exemplified by Chinese, Japanese, Hindus and Malays, in which the nose is usually short and broadened, but less so than in the Negro, and with a somewhat flattened profile.

The Russian peoples, because of their innumerable varieties, cannot satisfactorily be included within the limits of any single narrow classification. The so called Slav type depends more upon the peculiarities of its other facial features than upon those of the nose alone. This is true also in a measure of any race or people, since departure from a selected type is not infrequent among all of them.

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4

Anatomy of the Nose

The nose is made up of two parts the external nose and the internal nose.

THE EXTERNAL NOSE

The external nose which projects from the face has the shape of an irregular three sided pyramid. It consists of a framework of bone and cartilage covered by muscles over which lie the extended skin and the subcutaneous tissues of the surface of the face The cavity of the nose is divided into two chambers by a vertical septum. These cavities are lined with a mucous membrane that covers the periosteal and the perichondrial layers

Two sides of the nose are nearly symmetrical and join the face at wide-open angles These sides are separated from each other by a more or less sharp margin which is the dorsum of the nose The dorsum extends from the root of the nose which is continuous with the forehead, in a line downward and forward to the apex or tip This line may be straight, convex or concave When the dorsum is straight, the tip will be in a direct line with it when concave the tip will be upturned and when convex the tip will be depressed. The upper part of the dorsum is known as the bridge of the nose The third side of the external nose which is the smallest, forms the irregular triangular base of the nasal pyramid and is bounded by the lower margins of the lateral sides of the nose and by the upper border of the upper lip with which it is continuous There are two openings in this side the nostril or nares These openings are usually elliptical in adults and more circular in children They are separated from one another by a median septum or columella and each is bounded on the lateral side by the nasal ala which is the expanded lower part of the lateral surface of the nose The alae are separated from the adjacent lateral surface of the nose by a sulcus and the lower alar free margins form the lateral boundaries of the nares.

There are three types of noses, classified according to the differences in the proportion of breadth to length: $\frac{\text{Greatest breadth} \times 100}{\text{Greatest length}}$. This measurement is known as the cephalometric nasal index. It provides the following classification: (1) Long, high nose; (2) short, low nose; (3) an intermediate form. The first type is found most often among the white races, the second, among the black races, and the third, in the red and the yellow groups. Small variations in the shape of the external nose may represent both individual and family characteristics. They are of frequent occurrence and are not considered otherwise of significance.

Bony Framework of the Nose. On the anterior surface of the human skull, in the midline, there is a pyriform opening, which is the anterior entrance to the internal nasal cavity. It is bounded above by the lower margins of the nasal bones, laterally, by the borders of the nasal notch of the maxillae which is continuous, to form the lower boundary and the anterior nasal spine, which projects in the midline below.

THE NASAL BONES are a pair of small oblong shapes situated at the upper part of the face, forming the nasal bridge. Each is relatively thick and narrow in the upper part, thinner and broader in the lower. There are two surfaces and four margins on each.

The facial or outer surface is concave from above downward, convex from side to side, and it is perforated by one or two nasal foramina near the center. The branches of the anterior facial vein pass through these foramina. The nasal or inner surface is concave laterally and is marked by a longitudinal ethmoidal groove, through which passes the external nasal branch of the anterior ethmoidal nerve. The upper border is short and thick, with irregularities for articulation with the medial portion of the nasal border of the frontal bone or the nasofrontal suture. The inferior border is thin and is attached to the lateral nasal cartilage. There is a notch here for the passage of the external branch of the anterior ethmoidal nerve. The medial borders unite to form the internasal suture. These borders are prolonged backward in the form of a crest that rests on the frontal spine and on the anterior border of the perpendicular spine of the ethmoid. The lateral border articulates with the frontal process of the maxilla to form the nasomaxillary suture. Considerable variation in size of the nasal bones

frequently occurs, with relative variation in the size of the maxilla There is also variability in shape The nasal bones may be absent though this is a rare occurrence (See Plate 1)

The nasal cartilages make up the larger part of the framework of the external nose There are five principal cartilages (1) Two lateral nasal cartilages above (2) two greater alar cartilages below (3) a single nasal septal cartilage. The upper nasal cartilages are actually winglike expansions of the septal cartilage but in surgical *terminology they are spoken of as separate parts. This appears* more fully in the following paragraph There are also the small or lesser alar cartilages the sesamoid cartilages and the vomeronasal cartilages of Jacobson The lesser cartilages vary greatly in size and in shape as well as in number and all or part may be absent. All cartilages of the nose are bound together by more or less dense connective tissue (See Plate 2)

THE LATERAL NASAL CARTILAGE is bilateral roughly triangular and nearly flat. The shape varies within rather wide limits and not infrequently is quadrangular It is a lateral expansion of the septal cartilage and is present on the side of the nose just below the nasal bone where it is directed outward and downward Each cartilage has a superficial and a deep surface and three margins. In its superior third the medial margin is continuous with the anterior margin of the septal cartilage and with the opposite lateral cartilage *below it is separated from the septal cartilage by a narrow* cleft. The superolateral margin is curved and is firmly attached to the nasal bone and to the frontal maxillary process by strong fibrous tissue which it underlies for some distance near the septum The lower margin is connected by fibrous tissue to the greater alar cartilage

THE GREATER ALAR CARTILAGE which varies in form is situated on either side of the apex of the nose Each cartilage is thin curved and pliant, and is folded so that it forms a medial and a lateral crus. These crura help to hold open the corresponding nostril which they bound. The medial crura are loosely bound to one another both being situated below the septal cartilage to form the nasal tip The lateral crus which curves dorsally above the superior and anterior part of the ala is somewhat oval in shape and joins the medial crus at the apex of the nose. The angle formed by the crura varies and determines the shape of the nasal tip The

greater and the lesser alar cartilages form an incomplete ring about the nostril. The posterior extension of the lateral crus may frequently appear as separate lesser alar cartilages. In the space between each greater alar and lateral cartilages there may be a varied number of small sesamoid cartilages. (See Plate 7.)

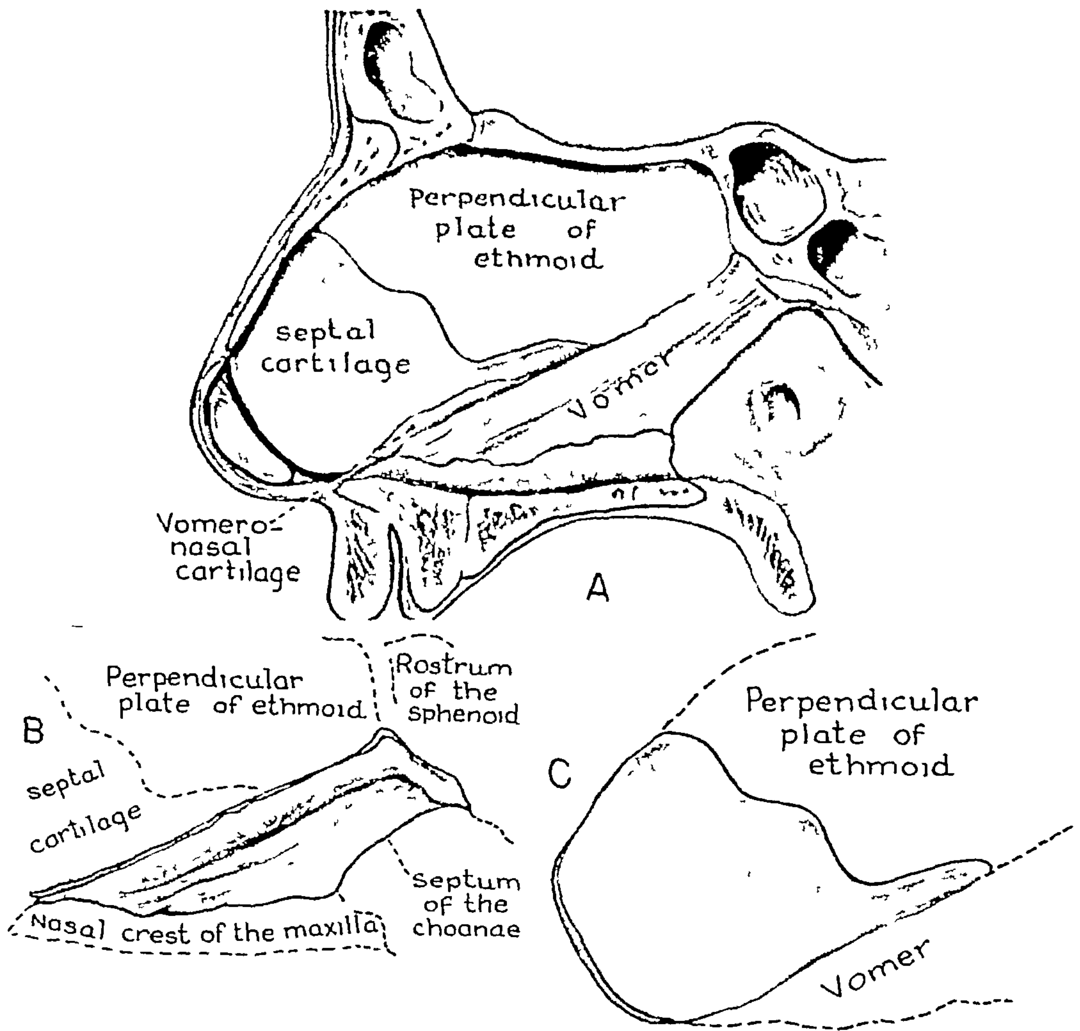


FIG 1 Anatomy of the normal nose

Joseph, following the opinion of Virchow, considered the name alar cartilage a misnomer, since this cartilage does not enter into the structure of the alae of the nose. He used the designation of tip cartilage instead. It seems probable that this may be a question of meaning, and the word wing may originally have been used to express the shape of the cartilage itself quite independent of the nasal alae.

THE CARTILAGINOUS PORTION OF THE NASAL SEPTUM includes (1) the septal cartilage and (2) the vomeronasal cartilages

The septal cartilage forms the anterior part of the septum It is quadrilateral in shape and fits into the triangular space of the bony septum Its anterosuperior margin in its upper part meets the inter nasal suture Below the nasal bone there is a shallow groove in this margin that narrows toward the tip of the nose Its borders are continuous above with the lateral nasal cartilages but they are separated by a narrow slit in their lower two-thirds This margin of the septal cartilage lies between the greater alar cartilages in its lower part. The antero-inferior margin extends posteriorly from the rounded anterior angle to the anterior nasal spine Below it is attached to the medial crus of the greater alar cartilage and the movable portion of the nasal septum The posterosuperior margin is attached to the perpendicular plate of the ethmoid The postero-inferior margin joins the vomer and the anterior part of the nasal crest of the maxilla where it becomes broader and is loosely attached to the nasal spine The septal cartilage varies in size and in shape depending on the degree of ossification of the bony septum It extends backward between the vomer and the perpendicular plate of the ethmoid to form the sphenoidal process of the septal cartilage If this process extends as far backward as to reach the sphenoid bone it can cause septal asymmetry (See Fig 1C.)

The vomeronasal cartilages (of Jacobson) are two narrow longitudinal cartilaginous strips from about 7 to 15 mm in length that lie bilaterally along the anterior part of the lower border of the septal cartilage They are attached to the vomer posteriorly and to the septal cartilage and the maxilla anteriorly In animals, the vomeronasal organ is well developed and is protected by these cartilages. In man it is a vestigial organ in general of importance only in that it may on rare occasions be the seat of malignant growth (See Fig 1B)

THE INTERNAL NOSE

The main nasal cavity (cavum nasi) is situated between the floor of the cranium and the roof of the mouth It is continuous anteriorly with the cavity of the external nose and posteriorly with the nasopharynx This cavity is divided by a median septum into two relatively equal parts that form the nasal fossae (fossae nasalis),

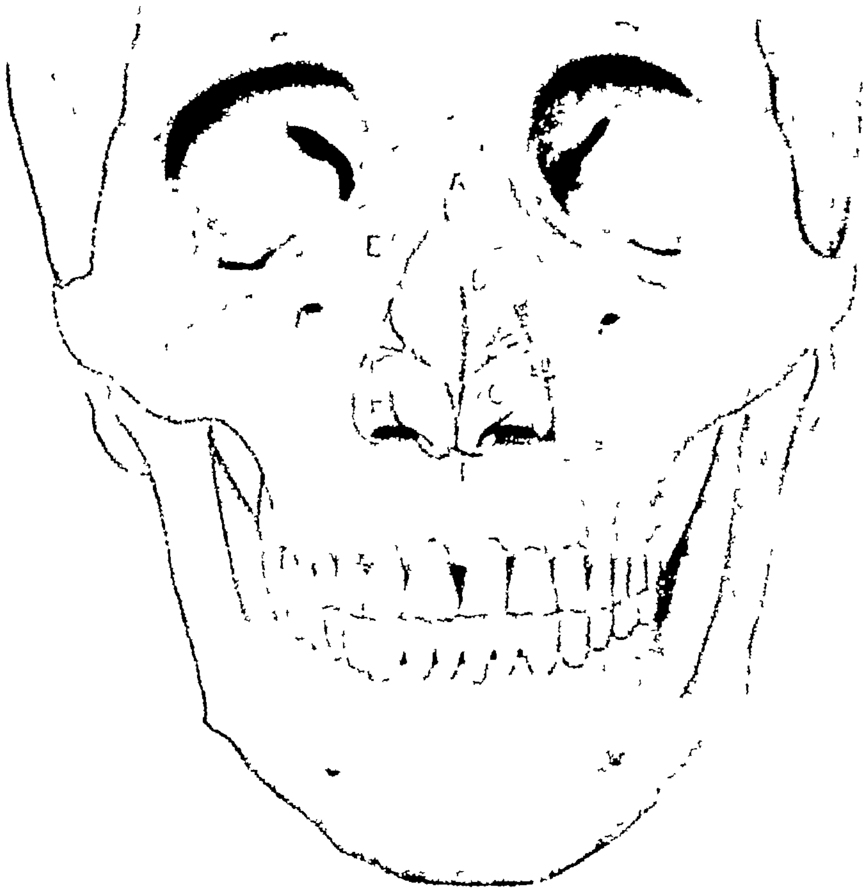


PLATE I (A) Nasal bones (B) Upper lateral nasal cartilages (C) Lower lateral nasal cartilages (D) Sesamoid cartilages (E) Nasal process of superior maxilla (F) Fatty tissue of ala nasi



PLATE 2 (A) Nasal bone (B) Lateral nasal cartilage (upper) (C) Lower lateral cartilage (alar) (D) Sesamoid cartilages. (E) Nasal process of superior maxilla (F) Fatty tissue of ala nasi



PLATE 3 (A) Pyramidalis nasi (m procerus) (B) M nasalis (compressor naris) (C) M quadratus labii superioris (caput angulare) (D) M orbicularis oris

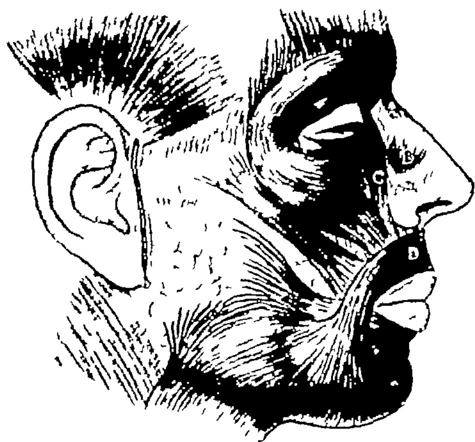


PLATE 4 (A) Pyramidalis nasi (or procerus) muscle (B) M nasalis. (C) M quadratus labii superioris. (D) M orbicularis oris.

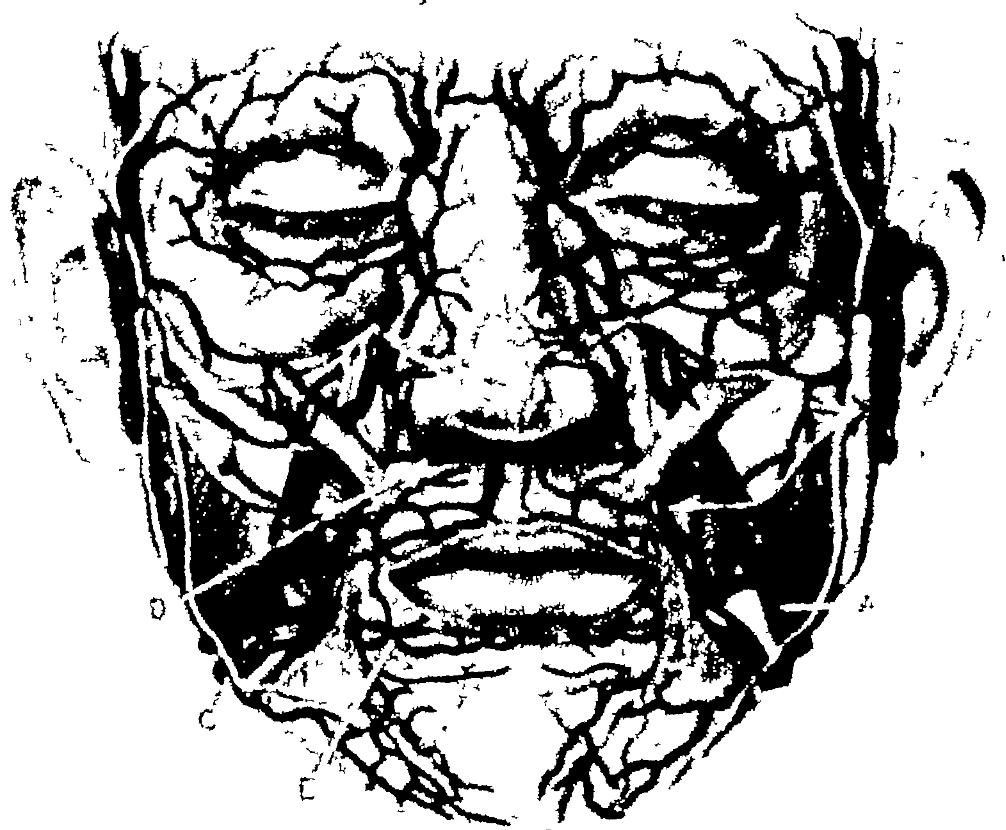


PLATE [illegible]. (A) Anterior facial vein. (B) Angular vein. (C) Facial artery (external maxillary artery). (D) Superior labial artery. (E) Inferior labial artery.

The fossae are divided by the turbinates into three grooves or meatuses, and extend into the surrounding bony structures—the frontal, the sphenoid, the maxillary and the ethmoid bones—as accessory or paranasal sinuses There is free communication with the outside through the external openings of the nose (anterior nares) and posteriorly through the choanae (posterior nares)

In the anterior portion of the nose, the boundaries are in relation to cartilages and membranes, while the walls of the internal nasal cavity are made up chiefly of bone Each fossa has a roof, a floor and medial and lateral walls The roof is horizontal in its middle portion, then slopes downward anteriorly and posteriorly. The anterior slope is formed by the posterior surface of the nasal bone and the nasal process of the frontal. The transverse part is formed by the cribriform plate of the ethmoid and by the sphenoidal turbinate The posterior slope corresponds to the inferior surface of the body of the sphenoid, the wing of the vomer and a small part of the sphenoidal process of the palate The sphenoidal sinus opens at the upper and back part of the roof, above the superior turbinate, into the spheno-ethmoidal recess The floor of the fossa is transversely concave and is wider than the roof The palatine process of the maxilla forms the greater part to which the horizontal portion of the palate bone is added posteriorly The incisive canal lies close to the septum anteriorly

The bony septum of the nose (septum nasi osseum) is the medial wall, formed by the perpendicular plate of the ethmoid, the vomer, the rostrum of the sphenoid, the crest of the nasal bones, the spine of the frontal bone, the combined processes of the maxillae (median crest) and the horizontal parts of the palatal bones In the anterior border of the bony septum is an angular notch, outlined by the perpendicular plate of the ethmoid and by the vomer. A part of the septal cartilage fits into this notch. The posterior border separates the two choanae and is formed by the pharyngeal edge of the vomer (See Fig 1A)

The lateral wall is most extensive It is formed by the frontal process with the medial surface of the body of the maxilla, the superior and middle turbinates of the ethmoid, the inferior turbinate, the perpendicular portion of the palate bone and the medial pterygoid plate The turbinates are usually three in number, but four may be present They curve inward and downward to form

three anteroposterior grooves (nasal meatuses) The superior meatus into which the posterior ethmoidal cells open lies between the upper and the middle turbinates and is the shortest. The middle meatus lies between the middle and the lower turbinates and it is here that the anterior ethmoidal cells and the frontal and the maxillary sinuses open The inferior meatus the longest, lies between the inferior turbinate and the floor of the nasal fossa On its lateral wall anteriorly is the lower opening of the nasolacrimal canal

The common meatus of the nose is the narrow space between the turbinates and the septum The nasopharyngeal meatus is that part of the nasal fossae behind the turbinates Its lateral wall is formed by the perpendicular portion of the palate and is pierced by the sphenopalatine foramen which leads into the pterygopalatine fossa The anterior or facial extremities of the nasal fossae are known as the pyriform openings The opposite or pharyngeal extremities form the choanae The choanae are separated by the posterior border of the vomer They are bounded above by the alae of the vomer the sphenoidal processes of the palate and the inferior surface of the body of the ethmoid laterally by the medial pterygoid plate below by the posterior edge of the horizontal portions of the palate bones

Soft Parts. The external nose is covered by skin which is thin and which moves freely over the underlying tissues except at its tip and over the cartilages where it is more adherent and considerably thicker The skin is supplied with many unusually large *sebaceous glands. It extends through the nares into the nasal vestibule* where it gradually changes to become the mucous membrane which lines the nasal cavity There are very fine scattered hairs on the outer surface of the nose but within the vestibule they are much more strongly developed.

The muscles of the nose converge about the nares

THE PROCERUS (pyramidalis nasi) is a small muscle overlying the nasal bones It arises from the lateral cartilages of the nose both directly from the bone itself and by a fibrous membrane from the lateral cartilages It is attached to the skin over the root of the nose, where its fibers and those of the frontalis muscle intermingle. This muscle acts to wrinkle the skin across the root of the nose thus serving as a muscle of expression It may be entirely absent.

THE NASALIS muscle is made up of two parts. The pars transversa is a triangular muscle lying on the side of the nose above the ala. Its fibers arise from an aponeurosis which is adherent to the skin but is not closely attached to the cartilage beneath, and lies upon the bridge of the nose. From this point of origin, the fiber bundles converge behind the ala, where they are attached to the skin along the nasolabial sulcus, the line that separates the ala from the cheek. The nasal process of the caput angulare (levator labii superioris alaeque nasi) covers its insertion, with intermingling fibers. It acts to compress the nostril. (See Plate 3.)

THE PARS ALARIS (nasalis) is a small muscle of quadrangular shape situated below the nasal opening and between it and the alveolar process of the maxilla. The muscle lies under the mucosa of the gum, the orbicularis oris and the quadratus labii superioris muscles. It fuses with the pars transversa laterally. It arises from the alveolar process occupied by the lateral incisor and canine teeth. Its fibers pass upward to the skin of the dorsal margin of the nostril and extend from the dorsal part of the wing cartilage to the septum. It acts to depress the ala.

THE DILATOR NARIS POSTERIOR is a thin triangular muscle which lies on the side of the ala of the nose. It arises from the skin of the nasolabial groove and is attached to the inferior border of the ala.

THE DILATOR NARIS ANTERIOR is often indistinct. It is a very thin muscle that runs from the lower margin to the cartilage at the front of the ala to the skin. (See Plate 4.)

THE DEPRESSOR SEPTI NASI is made up of a few muscle fibers, the location and the action of which are indicated by its name.

There are frequently considerable variations in the nasal musculature, and one or more of the muscles may be entirely lacking.

Blood Supply to the Nose. The arteries are branches of the facial artery and of the ophthalmic artery. The veins open into the anterior facial vein and also communicate with the ophthalmic vein.

Lymphatics. The principal lymphatics follow the course of the anterior facial vein and open into the submandibular lymph glands, but from the upper part of the nose a few vessels run sideward in the upper and the lower eyelids and end in the superficial parotid lymph glands. (See Plates and 6.)

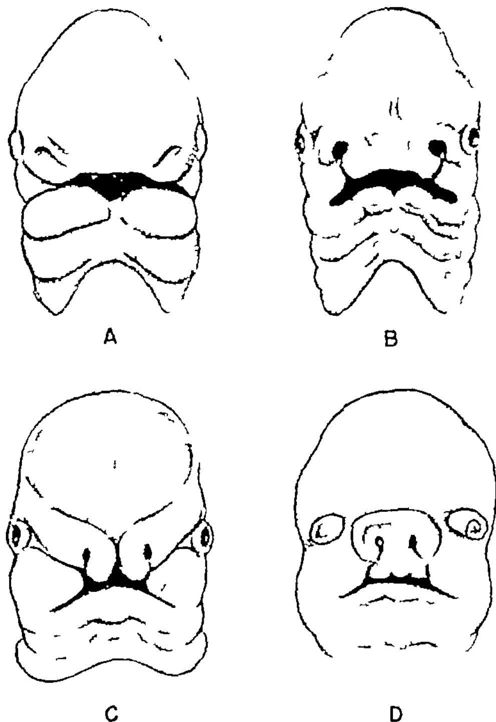


FIG. 2. Fetal development of the region of the nose (A) Five weeks. (B) Six weeks. (C) Seven weeks. (D) Eight weeks.

they differentiate both in relation to location and to individual characteristics, going on to a completion of a new independent organism.

In this manner successive cell division goes on to form the primitive blastoderm, which is made up of three layers of cells differentiated to constitute the ectoderm, the mesoderm and the entoderm. As development continues, at about the 4.5 mm. stage in the human embryo, on either side of the head end near the side of the closed anterior neuropore there appears a thickening of the ectoderm, which is the anlage of the olfactory organ called the olfactory placode. At this time this area is about 0.5 mm. in height and 0.2 mm. in breadth. It is oval in outline. Its border is not continuous, but remains unclosed in its anterior aspect. A foldlike thickening of the margin of this area, which forms a shallow depression, is seen in 7 to 8 mm. embryos (about the fourth embryonic week). Between these nasal areas is a broad strip of tissue called the frontonasal process. As the nasal areas deepen to form pits, with increase in depth of the surrounding mesoderm, there is narrowing of the distance between them and the relationship of the parts is altered. The nasal pits have migrated forward and downward, where they lie relatively near together but separated by a narrowed strip of mesenchymal tissue, which is called the infranasal area. The surfaces of the pit walls now form two processes on either side of the frontonasal area. On each side they form the rudiment of a medial and a lateral process. Between the fourth and the fifth weeks, further differentiation takes place and the medial portions of the primitive nasal areas become the medial or globular processes, and form the medial boundaries of the nasal pits. The lateral portions at the same time grow downward to become the lateral nasal processes which later become the primitive lateral nasal walls.

During this process of development, the maxillary processes of the first or mandibular arches grow forward and medialward to meet and later to fuse with the medial nasal processes. Each maxillary process passes forward below the eye and comes in contact with the posterior parts of the nasal folds of the corresponding side. That part of the maxillary process which touches the outer nasal fold increases rapidly in thickness and depth, and thus forms a definite lateral boundary to the cavity of the mouth. During this time the nasal folds grow deeper and the frontonasal processes have

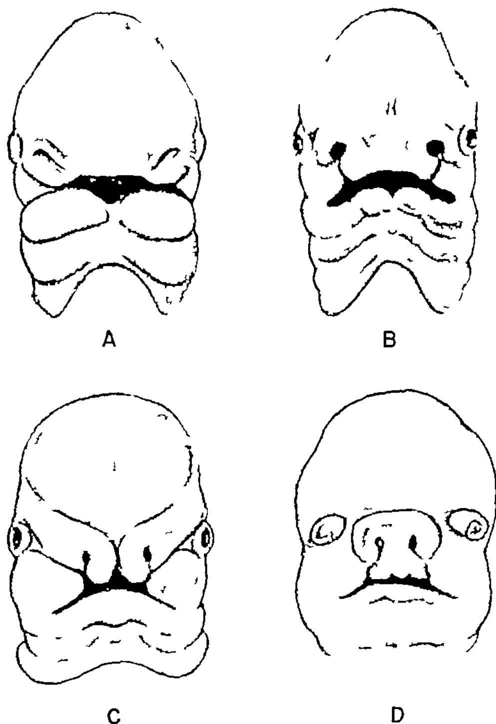


Fig 2. Fetal development of the region of the nose (A) Five weeks. (B) Six weeks. (C) Seven weeks. (D) Eight weeks.

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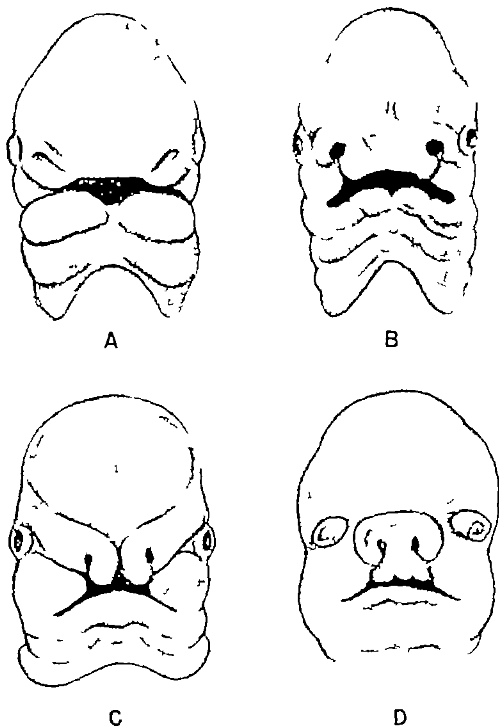


FIG 2 Fetal development of the region of the nose (A) Five weeks. (B) Six weeks. (C) Seven weeks. (D) Eight weeks.

As the pouchlike primitive nasal fossae extend backward, they finally meet the ectoderm of the primitive oral fossa. At this time (35 to 38 mm. embryos) the posterior wall of the nasal fossa is so thin that it usually disintegrates with the resulting appearance of the primitive posterior nares and the establishment of the communication between the nasal fossae and the oral cavity If the opening up of the posterior nares does not occur, an atresia of the choanae exists, which is seen occasionally both in fetuses and in the newborn infant Secondary blocking of choanal openings has been reported by Schaeffer This is caused by hyperplasia of the surrounding epithelium.

The position of the primitive choanae is not that seen at birth By the third embryonic month they have moved farther backward and their position is determined by the full development of the palate, at which time they are separated from each other by the posterior extremity of the primitive nasal septum

The anterior nares are open from the beginning, since they represent the mouths of the primitive nasal pits There is an exception not unusual during embryonic development when they are temporarily closed by proliferation of epithelial cells, similar to that which may also occur in the posterior nares Occasionally the closure is complete, though there are usually poorly defined passageways which penetrate the epithelial mass Schaeffer has reported having seen this phenomenon rather frequently in 40- to 60-day embryos Ordinarily, there is eventual breaking up of the cellular masses, with final complete opening of the nares If this does not take place, an atresia of the anterior nares results with possible organization of the obstructing epithelium In such case, membranes are established which may undergo more or less ossification and consequent stenosis of the anterior nares

The Palate. The limits of the primitive palate are established by the fusion of the maxillary and the lateral nasal processes with the medial nasal processes and the later rupture of the bucconasal membranes The palate at this stage of development forms a part of both the facial and the oral surface of the fetal head The facial part enters later into the formation of the upper lip The oral portion becomes the premaxilla Although there is still some question about this, there is general acceptance of the observation that the meso-

become more prominent. Soon the lateral extension of the maxillary process covers the posterior part of the lateral nasal fold while the frontal portion tends to turn inward to lie below and behind the outer nasal fold and extends across the posterior part of the opening of the olfactory pit to reach the medial nasal fold and fuse with it. In this way the nasal pit is converted to the primitive nasal fossa by the formation of a new floor posteriorly The mouth of the original pit, which is still open anteriorly is the primitive anterior naris.

This fusion takes place from within outward and forms the upper boundary of the oral cavity which in this manner is separated from the nasal pits Soon after this fusion of parts the lateral nasal processes also grow forward and medially until they meet and fuse with the upper aspect of the maxillary processes adjacent to the mesial nasal process. This fusion obliterates the naso-optic furrow

In the process of fusion which takes place there is first an intermingling of the apposed ectodermal cell layers followed by their disappearance and the formation of continuity between the underlying mesenchyme In this way the mesenchyme of the mesial and lateral processes and of the maxillary process becomes continuous

By the thirty fifth day the embryonic nasal pits have deepened sufficiently to appear as narrow fossae and the olfactory organ at this time is represented by two blind epithelial lined pockets which lie in the mesenchyme above the oral cavity The fossae have external communication by means of the anterior nares but the posterior extremity remains closed and the fossae are still quite widely separated by the thickened nasofrontal process

The growth of the walls of each cavity separates the roof and the floor by raising the former not by depressing the latter In extending upward there is left between the fossae a wall of mesoderm which becomes proportionately higher This mesodermal wall is the primary nasal septum

Since upward growth of the fossae has been accompanied by extension backward, in the 35-day embryo there are both mesial or septal and lateral walls. The latter still have a flat unvaried surface but the septal wall is more varied by the rudiment of the vomeronasal organ of Jacobson This appears as a shallow groove which is covered in by a fold in the nasal mucous membrane

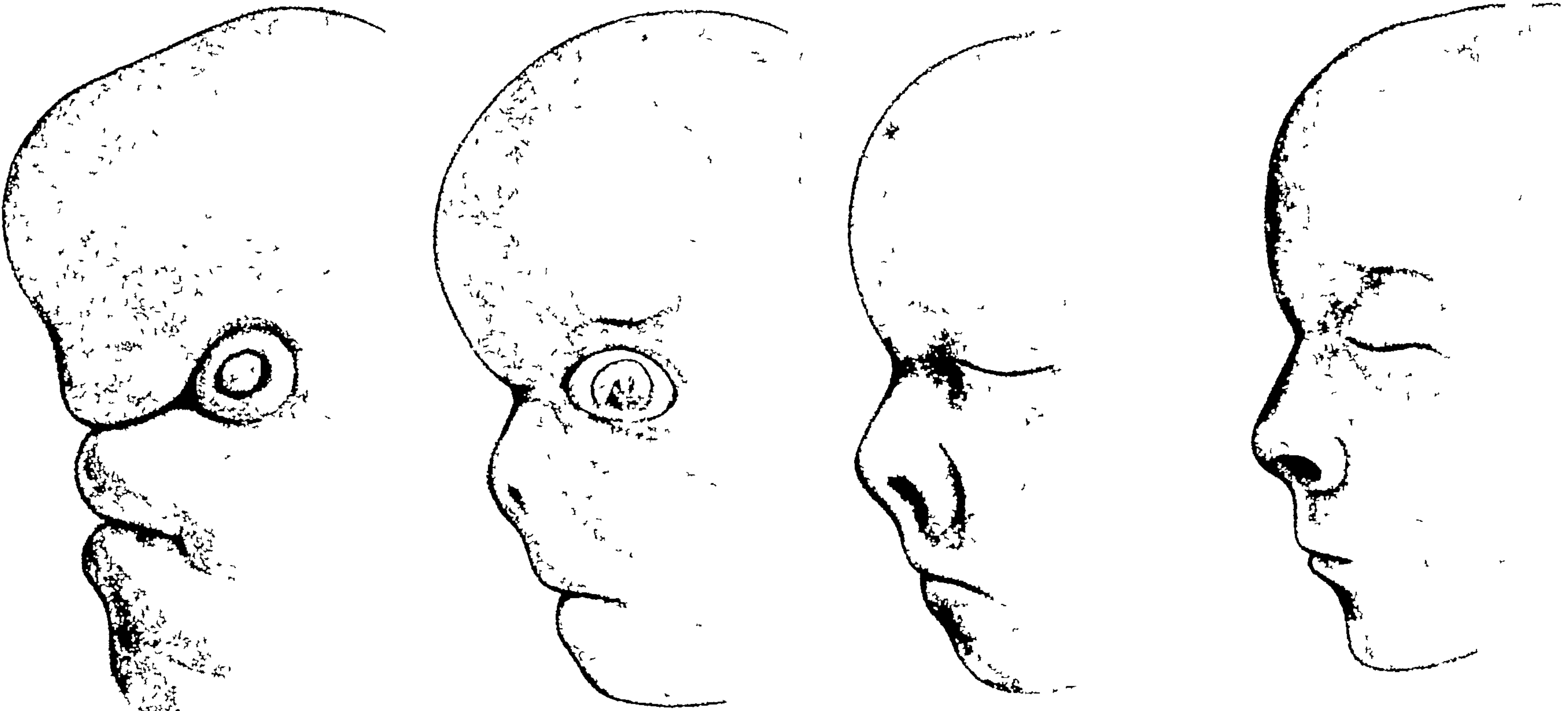


FIG 3 Later stages of fetal development Left to right Six weeks, ten weeks, twelve weeks, eighteen weeks

derm of both the facial and the oral parts is derived from the max illary and the medial nasal processes that the lateral nasal process contributes only to the lower border of the nostril

The formation of the complete palate includes the development of that part of the medial sides of the maxillary processes known as the palatal ridges These ridges are wedge shaped outgrowths, which appear from about the forty fifth to the forty-eighth day of embryonic life Early in the development of these processes they hang almost vertically in the direction of the mouth cavity towards either side of the tongue They then extend from the junction of the maxillary and the medial nasal processes where they are a continuation of the primitive palate to the posterior wall of the pharynx where they are continuous with the palatopharyngeal folds As growth proceeds there is fusion of the free margins of the palatal processes in the midline posteriorly fusion takes place with the lower border of the primitive nasal septum

The primitive nasal septum arises from the fusion which takes place between the medial nasal processes At this time the septum appears as a broad band of mesenchyme but during the latter part of the second fetal month this septal tissue begins to grow progressively thinner and finally fuses with the midpalatal ridge Some what later cartilage cells begin to differentiate within it and mu cous membrane develops on its walls

The Nasal Capsule. During the latter part of the second embry onic month a cartilaginous capsule forms round the growing fossae Chondrification extends into the septum but not into the floor of the fossae Since the increase in size of the fossae is in an upward direction the lower and front part of the cartilaginous capsule is formed first and progresses with the continued increase in size of the cavity When the fossae reach their final position the capsule is completed by the joining of its outer walls with the septal forma tion and by the fusion of the upper part of the entire structure with the alar orbital cartilage which lies behind it.

As the fossae continue to increase in size a maxillary area appears From this the inferior turbinate arises and as the height increases the middle and upper turbinates become evident

The nasal capsule and the ethmoidal region are late in becom ing cartilaginous. By the end of the third embryonic month the

nasal capsule is well advanced in chondrification The lateral walls of the nasal cavity chondrify independently and only later join the nasal septum to unite the cartilaginous roof and walls Still later, the lateral cartilaginous walls unite where the ethmoidal and septal cartilages are continuous

The inferior margin of the lateral cartilage folds behind the naris and becomes the cartilage of the inferior or maxillary turbinate The formation of other folds leads to the appearance of the middle and upper turbinates In the early stages these folds are entirely membranous, made up of epithelium and mesenchyme During the fourth embryonic month, differentiation of cartilage cells begins and progressive chondrification follows

Only parts of the cartilaginous nasal capsule persist in the adult nose, though the greater part differentiates into connective and bony tissues In this way, during the sixth fetal month, the individual nasal cartilages form, with separation of the anterior portion of the lateral cartilages from the septal cartilage The vomer develops during the eighth embryonic week through bilateral ossification of the lower posterior part of the primitive nasal septal cartilage Ossification takes place from behind forward and is only completed during the fifteenth year of life

Ossification of the palate begins about the end of the second embryonic month from a single center which lies about midway on the fusion line

The nasal bones ossify bilaterally from the surface of the cartilaginous nasal capsule Occasionally they ossify as a single bone, or one or both may fail to ossify

The maxillary processes ossify from a single center which appears from about the sixth to the seventh embryonic week All ossifying processes in these bones extend rapidly from this center

THE EXTERNAL NOSE

The external nose has been found to be fairly well defined by the end of the second fetal month It is then broad and flat with a groove at the junction with the forehead The dorsum is formed early and, as the nostrils move downward and medially, the lower portion of the dorsum, which is represented by the frontonasal process, grows downward and forward to enter into the formation of the nasal tip

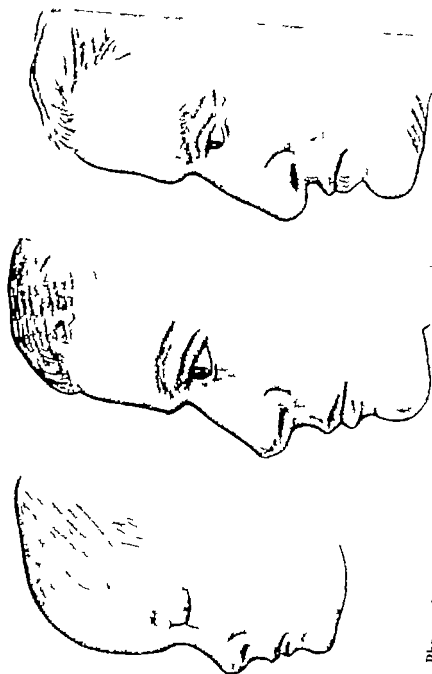


FIG 4 Phases of nasal change after birth Left newborn middle at maturity right, senium

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The Physiology of the Nose

In addition to its cosmetic value, the nose is an organ of unques tionable importance The complexity of its functions is rarely given adequate consideration Basically the activity of the nose is fourfold

1 As the organ of olfaction
2 To provide an airway to the lower respiratory tract
3 To protect the lungs by heating, moistening and cleansing the inspired air
4 To remove from its own surface the foreign material which has been collected from the inspired air

Bayliss with others speaks of olfaction as the chemical sense This statement is amplified by the reminder that the earliest animals arose in the sea where they would naturally be exposed to a great variety of dissolved chemical substances, that the sense of smell is a higher development of that primitive chemical sense, and that delicate receptive organs have gradually evolved in the land-inhabiting and air-breathing vertebrates Cannon characterizes this phylogenetic alteration by the statement that "instead of a water current which passes through the mouth, there is an air current which passes through the nose and across the ancient water course"

Although the importance of the olfactory sense in man is comparatively small when contrasted with that in animals and many lower forms, yet it fills a need that is far from negligible

The area of the surface within the nasal cavity which represents olfaction is about 250 sq mm on each side This area is situated in the upper and posterior part of the nasal cavity on the upper turbinate and the adjacent surface of the nasal septum Here is a narrow space in the form of a blind pouch which the main respiratory currents do not ordinarily reach This olfactory mucosa is usually distinctly yellow in color, in contrast with the pinkish tone of the surrounding surfaces

When fusion has taken place between the maxillary process and the medial and lateral nasal processes, the maxillary mesenchyme begins to grow into the tissue of the frontonasal process covering it entirely in front so that it no longer appears on the facial aspect as the nose In the course of further growth the nasal processes are in this way raised above the surface level and a new floor and the nasal vestibule are formed anteriorly

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To affect the olfactory cells, odorous substances must reach the upper part of the nasal chamber. The olfactory cells may also be reached through the posterior nares, especially from substances taken into the mouth. The theory has been expressed that the effect of organic compounds upon the olfactory cells gradually increases with the increasing complexity of their molecular structure.

The Respiratory Airway. Proetz stresses the fact that the nasal cavity is more than a tube leading from the nostrils to the larynx. As inspired air passes through the nostrils, it enters the vestibule. This part of the nose is described by Frazer as being formed at the period of embryologic development when the maxillary processes have fused with the medial and lateral processes by the overgrowth of maxillary mesenchyme upon the surface of the primitive nose about the anterior nares, to become that part of the nose known as the vestibule.

The nasal vestibule is bounded laterally by the ala of the nose and is limited above by the lower border of the lateral cartilage which Mink has called the nasal valve. The lower border of this cartilage narrows the passage into the nasal cavity to form what Zuckerkandl named the ostium internum, which Mink considered far more important than the outer nasal opening. The nasal alae and this "valve" not only have a cartilaginous framework, but they can also be influenced by the pars alaris of the nasalis muscle. It is this formation which largely determines the direction, volume and speed of air currents, or the way in which air passes through the nasal cavity.

Path of Air Flow Through the Nasal Cavity. There is considerable difference of opinion concerning the exact manner in which the inspired air reaches the choanae after entering the anterior nares. Proetz has found that the stream of air does not follow a straight pathway between these two openings, but that it passes in a wide curve from the nostril through the olfactory fissure to the choana. Focal eddies of air take place (1) downward in the vestibule, (2) downward over the inferior turbinate and (3) against the face of the sphenoid. Air enters the inferior meatus very little, if at all. The direction of the anterior nares, the vestibule, the shape of the nasal vault and the size of the choanal opening decide the path which is followed by the inspired air. These structures also determine the path of the expiratory current, so that

There are a number of functionally different cells in this area of mucous membrane

1 Columnar cells without cilia with a broad extremity at the mucosal surface which taper downward into one or more irregular branched processes the terminations of which penetrate into the underlying layer

2 Bipolar nerve cells with a small body and a large spherical nucleus which lie between the lower part of the columnar cells and send a process upward to the surface From the lower pole of the cells, a very delicate process extends downward toward the layer below

3 In the deep layers there are the serous glands of Bowman which send fine ducts between the overlying cells to reach the surface

The bipolar cells are olfactory receptors The two types of processes to which they give rise represent an axone and a modified dendrite The axones which arise from the lower extremity of the cells combine to form slender bundles The dendritic processes are thick and cylindrical and penetrate separately through small spaces between the surrounding or supporting cells Each dendrite then divides into a tuft of from 6 to 8 straight filaments which extend a short distance beyond the mucosal surface The terminals of the axones pass upward through minute perforations in the floor of the skull (the cribriform plate of the ethmoid) and enter directly into the olfactory bulbs Here these fiber endings come into relation with other neurones which carry sensory impulses to the olfactory center of the brain in the region of the hippocampal gyrus Thus the olfactory system is not true peripheral nerve but a fiber tract of the brain

It is important to bear in mind that the effect of many pungent and acrid substances is to bring about sensation chiefly through their stimulation of the common sensory nerve in the nasal mucosa rather than through their action on the olfactory endings

As has already been emphasized, olfaction is a chemical sense To cause stimulation of the olfactory nerve cells a substance must be present in the form of a gas or otherwise be finely dispersed in the air The olfactory epithelium is bathed in liquid which the nasal glands secrete and stimulation depends upon the solution of odorous substances in this fluid.



FIG 6 *(Top)* With a long or hanging nasal tip the amount and path of the air current are markedly altered Compare with Fig 5, top *(Bottom)* When the tip of the long nose is lifted by suitable upward pressure with the finger, the inlet is enlarged and the path of the air current becomes comparatively normal

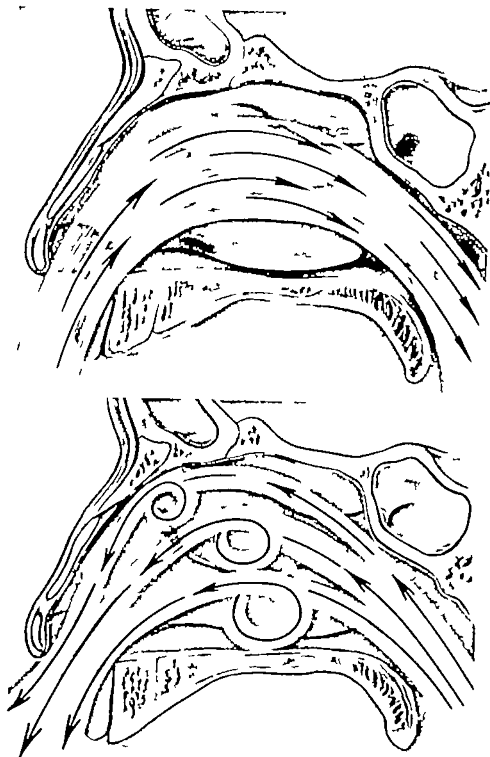


Fig 5 *(Top)* Path of inspired air through the normal nasal cavity *(Bottom)* Illustrates the formation of eddies in the air current on expiration



FIG 6 (*Top*) With a long or hanging nasal tip the amount and path of the air current are markedly altered Compare with Fig 5, top (*Bottom*) When the tip of the long nose is lifted by suitable upward pressure with the finger, the inlet is enlarged and the path of the air current becomes comparatively normal

one passage is very much like the other except that expiratory air may enter the middle meatus in passing out. Definite eddies are caused by the effect of the inlet (choana) being larger than the outlet (naris) The largest eddy nearly fills the entire nasal vault. As described by Proetz, after passing through the nasal vault the respiratory air meets resistance at the nostril and is divided into two parts One part passes out through the nostril while the other turns backward through the inferior meatus to rise and become mixed with the current from the pharynx above the choana where it comes in contact with the edge of the posterior tip of the middle turbinate by which a portion is directed into the middle meatus According to this plan a high curve through the nasal fossae is followed by the inspired and expired air but it is only on expira tion that air enters the meatuses Thus the paths of air currents in the nasal cavity depend upon its physical conformation Varia tions may arise from individual differences in the face of the septum or of the lateral walls Change of direction of air flow may also be caused by any constrictions or other obstacles Such obstructions may be of considerable importance though they may go unrecog nized

Atmospheric Pressure in the Nose. Based on readings of pressure in 110 subjects Simon found no difference in that of the two sides unless there was a marked difference in the size of the cavities For the 220 recordings pressure on expiration was 1 5 mm or more on inspiration it was 5 6 or less. Following vasomotor constriction there was always a lessening of inspiratory pressure in both fossae. *An occlusion in any part of the nasal fossa tends to raise the pres sure on that side and somewhat also on the opposite side.* This condition occurs in the presence of an edematous inferior turbinate or any obstruction of a similar sort.

Humidification. Respiration in an adult engaged in ordinary activities requires approximately 500 cu ft. of air in a day Water saturation of 500 cu ft of air at body temperature requires less than 0 7 L. but it has been demonstrated that the nasal secretion exceeds 1 L. in 24 hours

Experiment has shown that if all the water is extracted from a given amount of air and it is then passed in at one nostril and collected as it leaves the other about 26 Gm of water are added to



FIG 7 (*Top*) Path of inspired air with depression of the bridge of saddle nose (*Bottom*) The path and distribution of the inspired air current are nearly normal after raising the dorsum and inserting the implant.

one passage is very much like the other except that expiratory air may enter the middle meatus in passing out. Definite eddies are caused by the effect of the inlet (choana) being larger than the outlet (naris) The largest eddy nearly fills the entire nasal vault. As described by Proetz after passing through the nasal vault, the *respiratory air meets resistance* at the nostril and is divided into two parts One part passes out through the nostril while the other turns backward through the inferior meatus to rise and become mixed with the current from the pharynx above the choana where it comes in contact with the edge of the posterior tip of the middle turbinate by which a portion is directed into the middle meatus According to this plan a high curve through the nasal fossae is followed by the inspired and expired air but it is only on expiration that air enters the meatuses Thus the paths of air currents in the nasal cavity depend upon its physical conformation Variations may arise from individual differences in the face of the septum or of the lateral walls Change of direction of air flow may also be caused by any constrictions or other obstacles Such obstructions may be of considerable importance though they may go unrecognized

Atmospheric Pressure in the Nose. Based on readings of pressure in 110 subjects Simon found no difference in that of the two sides *unless there was a marked difference in the size of the cavities* For the 220 recordings pressure on expiration was 1.5 mm or more on inspiration it was 5 6 or less Following vasomotor constriction there was always a lessening of inspiratory pressure in both fossae An occlusion in any part of the nasal fossa tends to raise the pressure on that side and somewhat also on the opposite side This condition occurs in the presence of an edematous inferior turbinate or any obstruction of a similar sort.

Humidification. Respiration in an adult engaged in ordinary activities requires approximately 500 cu ft. of air in a day Water saturation of 500 cu ft of air at body temperature requires less than 0 7 L. but it has been demonstrated that the nasal secretion exceeds 1 L. in 24 hours.

Experiment has shown that if all the water is extracted from a given amount of air and it is then passed in at one nostril and collected as it leaves the other about 20 Gm of water are added to

opposite these areas is similar in structure but less highly developed. A 2- to 3-degree lessening of the temperature of the lower turbinates may be of greater importance in heat production when compared with the mucous membrane elsewhere in the nasal cavity.

The filling and emptying of the blood vessels in the cavernous tissue is controlled by a reflex nervous mechanism, by which the total surface is increased and decreased automatically. When cold air comes in contact with the nasal mucous membrane, the capillary blood supply is immediately increased.

The Nasal Cleansing Mechanism. With the exception of that in the vestibule, the epithelium lining the greater part of the nasal cavity contains ciliated cells. The cilia are especially evident over the lower and middle turbinates. The function of the cilia is to move toward the nasopharynx all foreign material upon their surfaces. This process is aided by the layer of mucus which covers the intranasal surfaces. These secretions of the nasal lining membrane are varied in composition and viscosity. The latter is generally similar to that of blood plasma and of most physiologic transudates.

Cilia also line the ducts of the glands and their motion constantly propels the secretions outward. This layer of mucinous secretion is continuous from the front part of the nose, through the nasal passages, the pharynx and the esophagus to the stomach. It is also present on the lining membrane of the accessory sinuses. Throughout this entire extent, the waving motion of the cilia, traction from the esophagus and gravity keep the mucous layer in constant motion. The rate varies from relatively slow in the more anterior part of the nose to increasing speed in the posterior portion. The path followed by these secretions differs from that of the air currents. Drainage from the more inactive areas in the anterior third of the lateral walls takes place through the middle and inferior meatuses. The greatest speed is usually present in the meatuses, which are best protected from the respiratory air currents. Drainage from the nasal floor usually is directly backward to the soft palate. The anterior septum drains diagonally down to the floor, which is followed back to the soft palate. More active septal drainage areas lead directly back to the posterior margin of the septum. On reaching the soft palate, the entire accumulated material is swallowed directly into the esophagus.

1 cu m of air as it passes through the nasal cavity This is only about two-thirds of the maximum possible saturation

Under normal conditions increased activity of the glands of the nasal mucous membrane does not increase the humidity of inspired air though it acts to maintain a constant degree of humidity for a longer period of time in the continually moving air

Disturbance of the moistening faculty may be due to asymmetries of the nasal passages and to sufficient degrees of constriction Deflection of the air currents from the normal pathway brings about a change in the mucosal structure and a consequent alteration in the amount and nature of the secretion of the glands

Heating The function of warming the air which passes through the nasal cavity depends upon the integrity of the mucosal lining and of the underlying network of blood vessels which forms an erectile tissue of cavernous structure There is a subepithelial arterial network from which both a superficial and a deep venous plexus arise

Macdonald studied the temperature modifications of the aspired air by attaching one end of a piece of rubber tubing to the opening of a tracheal cannula in a tracheotomy and connecting the other end of the tubing to one nostril Readings were made before the air entered the trachea His findings were as follows

At 7° C the temperature is raised to 28 8° C.
At 1 7° C the temperature is raised to 35 0° C
At 7 0 C the temperature is raised to 34 0° C.
At 12 0 C the temperature is raised to 35 6° C
At 45 0 C the temperature is reduced to 33 6° C

The experiments indicate that the nasal lining alone is capable of maintaining a nearly constant temperature of inspired air comparable to that of the circulating blood regardless of its temperature on entering the nose

It was also observed that a subject in good physical condition raised the temperature of the inspired air two or more degrees higher than one who was anemic This difference in warming ability resulted from the loss of erectile capacity of the intranasal tissue

The cavernous tissue is present chiefly over the inferior turbinates and along the free edge of the middle turbinate with greater development at the posterior extremity The septal vascular tissue

determinations on 142 subjects ranging from 17 to 95 years of age, representing both normal persons and those with acute rhinitis. From their results it was concluded that the slight variation in pH of the nasal mucosa both in the normal state and with acute rhinitis was either within the range of neutrality (pH 7.0) or slightly alkaline.

Nerve Supply. The nasal mucous membrane is controlled both by a vasomotor and a cerebrospinal system of nerves This innervation makes possible a variation in the degree of turgescence and a response to local stimulation Stimulation of the sensory nerve supply usually produces dilatation of the vascular tissue, though less often, and depending upon the nature of the stimulus, contraction may occur. There may be vascular dilatation or contraction within the nose as a result of the stimulation of the nervous mechanism of organs at a distance. There is a similarity of the nasal cilia to the cardiac tissue, in their spontaneous rhythm and neural inhibition

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The normal ciliary current in the nasal cavity moves at a rate of about 4 mm. an hour Ciliary movements are more rapid with slight increases of temperature and under the effect of dilute alkali with strong alkalis, acids and temperature above 45 degrees C. ciliary movements stop completely When ciliary action is stopped by reduction of temperature or lack of oxygen activity is resumed on their restoration The lack of a normal supply of oxygen in the use of an anesthetic will cause cessation of ciliary action

Chronic anoxia from any cause results in symptoms which are clinically similar to those of fatigue These symptoms are both mental and muscular and resemble those which are present in neurasthenia and neurosis

Hilding made 106 cultures of material taken from the middle meatus after the nostrils had been closed with cotton for 20 minutes to allow for self-cleansing Thirty two were from clinically normal noses 74 were from subjects with colds. About one half of these cultures were entirely sterile In the remainder there were usually pure cultures of streptococcus staphylococcus or diphtheroids The growth was very scant in most of the cultures A pure culture of streptococci one day might give place to one of pure diphtheroids the next.

The same author also found that it was possible to change the nature of the nasal mucosa from a ciliated to a stratified type merely by exposing a focal area to an increased amount of air If one nostril was closed, there was a change in the opposite or open side Nonciliated epithelium normal only in the most anterior part of the nose vestibule appeared over the greater part of the septum

PH of the Nasal Secretion Opinions on this subject seem to be diametrically opposed. Fabricant has reported that he found no appreciable length of time during which the secretions of the nasal cavity remained at a constant pH The fluctuations in the normal nose were between pH 5 5 and 6 5 Both reducing and raising the temperature caused a change of the pH Increased continued cold tended to increase alkalinity Heat applied in the same manner caused a shift toward the acid side In the active phase of acute rhinitis, the pH of the nasal mucous membrane was alkaline

Employing an apparatus that they consider more adequate than that used by other investigators of the subject to secure better con tact and in this way avoid error Nungester and Atkinson made 173

7

Preliminary and Postoperative Measures

PSYCHOLOGIC FACTORS

The importance of the mental factor in plastic surgery should not be minimized. This question concerns both the surgeon and the patient. From the standpoint of the success of the operation, the patient's attitude toward the deformity should be carefully considered.

Four mental types were recognized by Joseph, and were classified according to what he called esthetic sensibility. He emphasized what is well recognized by the experienced plastic surgeon, that the chief aim of a plastic operation on the face is essentially to relieve the depressed mood of the patient. His four classes are characterized as

1. Those with extreme deformity or defect, but with little or no emotional reaction thereto. They wish to be relieved of the burden of the defect, but are easily satisfied with the result and are willing to leave the situation entirely to the surgeon.
2. This group comprises the greater number of those who seek facial repair. They are capable of evaluating their deformity reasonably and are not definitely depressed by it, though they feel relief and are grateful to the surgeon for a successful operation.
3. The members of this group are much disturbed by even a very slight disfigurement. They may not infrequently entertain suicidal ideas because of it, and even attempt to put such ideas into action. They are outstanding in comparison with those of the first group, whose reaction to extreme deformity is only slight, while their reaction to slight deformity is extreme. Included among these latter are many who have a strongly developed feeling for beauty, as artists and sculptors. They are always insistent on a perfect result, and any outcome which is less than their idea of perfection

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FIG 8 Photographs of the six poses required of each patient before corrective operation (1) Full face (2) Nostril view (3 and 4) Left profile sober and smiling (5 and 6) Right profile, the same

will continue to affect them in the same manner as the original defect But if their anticipated results are realized by the operation they express excessive gratitude

4 This is a relatively small group whose members complain of defects which do not in reality exist. Operation should rarely be undertaken on these patients to gratify them since it usually fails to remove the basis of complaint The individuals in this group are sufficiently abnormal to justify referring them to a psychiatrist for a mental examination

These four classes are not clear-cut entities since there are necessarily gradations between them

Another group should be emphasized If there is any suspicion as to the character of a person who applies for an operation, operation should be delayed until this question is satisfactorily settled This applies particularly to an individual who may come from a distance and be in great haste to have an operation completed In such a situation an unusually careful history should be taken and if it appears justified the police should be notified in order to make sure that the subject is not a criminal seeking to avoid detection

In all cases of reparative operation about the face, the question of a resulting scar or something less than an ideal result should be carefully and completely gone over with the patient, who should then have the final decision for the operation

One should particularly avoid promising more than can be reasonably anticipated in considering the result of any operation It is wiser to promise too little than too much since the patient's satisfaction depends so largely on realizing more than what is anticipated.

The possibility of relieving worry and aiding a person with facial disfigurement is of no small importance. Instances where such persons have been able to live normal lives after long periods of isolation when they could not enter into social and economic activities are well known to the plastic surgeon It was Dieffenbach's opinion that repair and restoration of defective parts of the body especially of the human face are of such significance both for the disfigured one and for human society in general that even the least advancement of the surgeon's art in this relation is worth being made known.

The factor of age also presents questions of importance As a rule, corrective surgery of the nose should not be undertaken until after sixteen years of age in the male and seventeen in the female, since the nasal structures are not maturely developed until that time In a young child, nasoplastic surgery is advisable only for the purpose of improving defective function In older persons, loss of

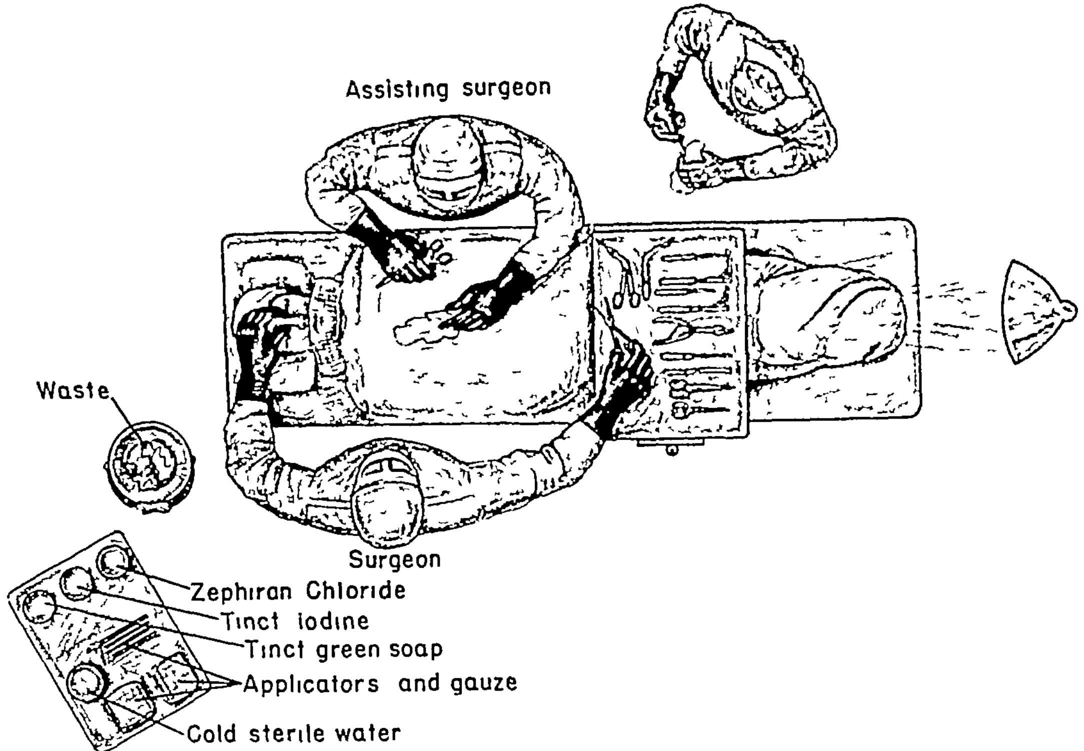


FIG 9 Positions of surgeon and assistants during operation, viewed from above

blood should be particularly avoided to prevent shock The function of the heart and the kidneys are often lessened, and in such case there is associated more or less degeneration of the vascular system The ability of such patients to recover vital power is decreased, and wounds tend to heal less quickly

The Operating Room. Nasal operations, like those of general surgery, should preferably be done at a hospital, where operating rooms have routine care and control No physician should undertake to do an operation in an operating room for which a number of successive operations are scheduled to be done by other surgeons Such a situation will necessarily cause a feeling of haste, and this in turn may lead to unsuccessful operating and poor operative results Thus, it should be an invariable rule to arrange for the use of an

PREOPERATIVE PREPARATION

The patient should always have a thorough physical examination before any operation upon the nose since it is of particular importance to the success of the operation that the subject be in good physical condition In Fomon s opinion no operation can be considered free from danger and all candidates for operation must be regarded as potential risks This importance was expressed much earlier by Paget (1875) who said that no operation even one that seemed the most trivial should be undertaken without an examination of the patient to avoid endangering life Such careful examination may reveal the presence in the patient of epilepsy blood dyscrasias diabetes endocrine defects (acromegaly myxedema) syphilitic or tuberculous conditions all of which contraindicate operation until the disease is no longer present.

Routine examinations which should be made are

1 Urinalysis.

2 Blood counts both qualitative and quantitative clotting bleeding and sedimentation time

3 Serology

4 Still photographs (a) Direct profile (b) smiling profile to judge the length of the upper lip, (c) front face (erect) to show deviation or other anomalies (d) front face with head tilted backward, to show the shape of the nostrils.

5 Profilometer measurements

In selected cases also Motion pictures (Kodachrome) plaster or wax model of the proposed restoration plaster cast of the face

If the bleeding and the coagulation times are prolonged the patient is given calcium lactate (gr x) the number of doses depending upon the laboratory findings or vitamin K (5 mg t i d) for two or three days before operation It may also be desirable to continue one of these agents for a few days following the operation This is a question which must be decided by the operating surgeon

It is important also to determine whether there are any signs of food sensitization or special reactions to drugs (allergy) or anything unusual in the patient s earlier experience with an anesthetic If there has been a previous operation whether the scar formation has given any suggestion of hyperplasia (keloid) Sufficient time should be allowed between successive operations

to cocaine or procaine hydrocloride in patients who are sensitized to these agents Amytal also prevents spasm of facial muscles or convulsions. For excitable patients, Joseph recommended giving a moderate dose of bromide two hours before the operation, or, if there was sufficient need, a small dose of morphine—about ¼ gr. The writer no longer uses morphine unless it is particularly indicated

Preparation of the Field. Since it is difficult to obtain complete sterilization of the nasal cavity, measures for extreme cleanliness are particularly necessary.

The patient is placed on the operating table with the head raised at an angle of about 35 degrees Two sterile towels are laid under the head, the upper one is wrapped closely about the head, with the face fully exposed so that the nose can be easily seen The mouth is covered with a thin layer of gauze, which is loosely attached on each side with hemostatic forceps to the draping of the head. This gauze over the mouth is moistened by pouring on cold sterile water, which helps to keep the lips moist, lessens thirst and gives general comfort to the patient Gauze squares are occasionally placed over the eyes if the patient wishes it

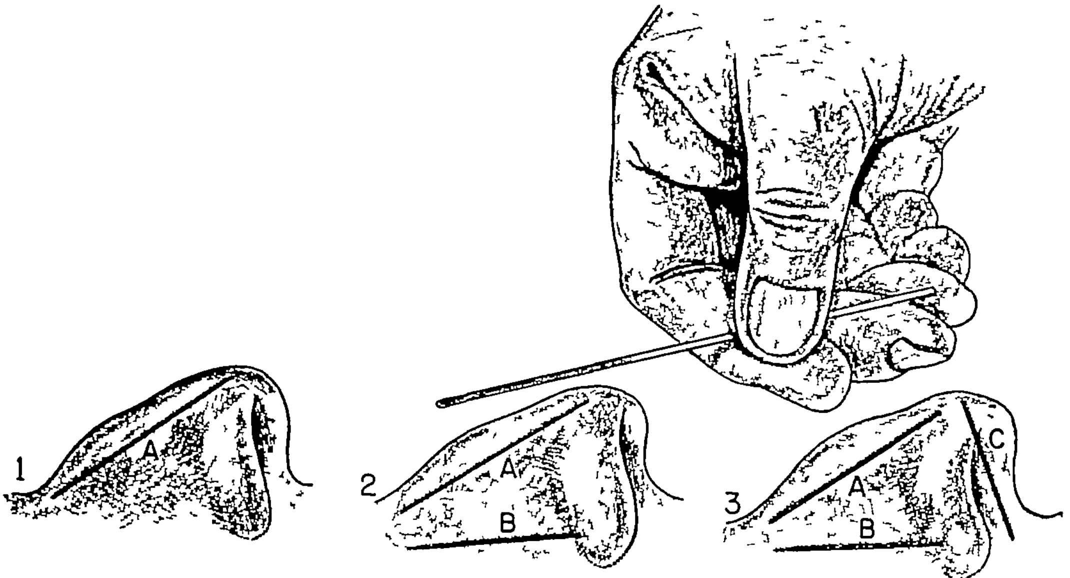


FIG 10 Proposed profile line marked with applicator dipped in alcoholic mercurochrome (1A) Profile line to be reduced (2B) Nasofacial groove where the superior process of the maxilla is sawed in narrowing the nose (3C) Line of proposed reduction of septal cartilage

operating room when no one else will be waiting to use it. Lights with a strong glare should not be permitted at operation as they may interfere with vision and induce fatigue in the operator Soft lights are desirable for their effect on both the surgeon and the patient, with preference for green or blue tones The field of operation should be directly lighted and all shadows should be carefully avoided so that a correct impression of the deformity may be clearly gained.

If the surgeon chooses to operate at his own offices there should be a well-equipped room for this purpose and a specially trained nurse to assist him Surgical cleanliness which means sterilization should be most carefully provided wherever plastic operations on or about the nose are to be performed The writer always oversees personally the assembly of his instruments and prepares them for sterilization They should be carefully dried on removal from alcohol since alcohol is irritating to the tissues All instruments should be laid out on the Mayo table so arranged that each one will be within easy reach of the operator Proper instruments facilitate operation and in the individual steps the suitable ones should be chosen for use When instruments are arranged to suit the operation to be performed each is at the surgeon's fingertips at the moment when needed. All confusion of handling is avoided such as the clashing or the dropping of instruments on the table It is of particular importance also that a nurse should never be reproved for any mistake or carelessness in the presence of the patient, since this may be assumed to be a cause of unsatisfactory results of the operation if any should chance to be the outcome.

On a separate table especially adapted for the purpose the writer has four cups arranged from side to side according to their contents in the following order (1) Tincture of green soap (2) alcohol (colored) (3) Zephiran (4) cold sterile water There is also on this table a small jar containing equal parts of 4 per cent cocaine hydrochloride and 1 1000 adrenalin solution (See Fig 9)

Preparation of the Patient. The patient should be advised to retire early the night before the day proposed for operation and if necessary because of restlessness which prevents sleep a mild sedative may be prescribed It is routine practice of the writer to give the patient 3 gr of sodium amytal one hour before the operation This secures mild sedation and also acts as a preventive of reaction

the control of these fingers to the nasal root, in a plane above the perichondrium and the periosteum. Here, 0.5 cc. of the solution in the needle (1 per cent novocaine hydrochloride with 5 drops to the ounce of 1:1000 epinephrine hydrochloride) is injected. This secures infratrochlear nerve block. The process is then repeated on the other side of the nose.

Then with a $1\frac{1}{2}$-inch 24-gauge needle introduced intranasally at the extreme outer margin of the pyriform opening and carried to a point which is determined by the intersection of (1) a vertical line drawn 1 cm. lateral to the inner canthus and (2) an oblique line from the columella to the outer canthus, 0.5 cc. of the solution is injected during the withdrawal of the needle. This secures infra-orbital nerve block. The procedure is then repeated on the opposite side. (See Chap. 11, Typical Rhinoplasty.)

Instruments. The design and the shape of each instrument are adapted to a definite purpose and without a complete instrumen-

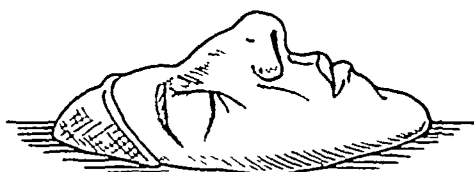


FIG. 11. Completed profile wax mask.

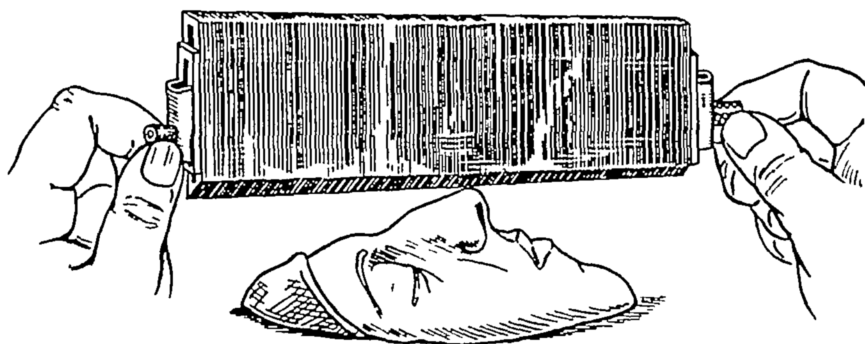


FIG. 12. Wax mask with profile gauge (Stockton) held in position for first step.

tarium it is not possible for the plastic surgeon to operate successfully.

All instruments, carefully sterilized, should be so arranged as to be within easy reach of the surgeon.

The hairs about the nares within the vestibule are carefully removed with sharp-pointed curved scissors. This should be done with particular care so that the tissue surface is not injured. The entire face and the nasal cavities are then scrubbed with tincture of green soap (U. S. P.) and hot water, followed by thorough rinsing with warm sterile water, constant care being taken that the nasal mucosa shall not at any time be injured. The face is finally sponged with alcohol and painted with a dilute solution of zephiran, followed by another alcohol sponge and then carefully dried.

At this point the septum is anesthetized by means of pledgets of cotton or cottonoid cut in the shape of a Simpson splint, wet with equal parts of cocaine hydrochloride and 1:1000 epinephrine hydrochloride, placed inside the nasal cavity for three minutes and repeated until good anesthesia of the septum is obtained. Three applications are usually required. (The writer has found the cottonoid preferable as it is softer and easily tolerated.) Or anesthetization can be obtained by injecting under the perichondrium a 1 per cent solution of novocaine hydrochloride to which 3 to 4 drops of 1:1000 epinephrine hydrochloride have been added. Following this anesthetization of the septum, strips of ½ inch gauze are inserted into the nasal cavities to exert hemostasis and prevent postnasal drip.

Anesthetization of the External Portion of the Nose. Concerning the general question of the best method of anesthesia, the writer's own experience has shown infiltration anesthesia to be the method of choice. General anesthesia is cumbersome and makes operation more difficult. If for any special reason a general anesthetic should be found necessary, ether by intratracheal inhalation is the method preferred.

Safian emphasized that the local method should be used without exception. On the other hand, though he recognized the greater advantages of local anesthesia, Joseph considered general anesthesia sometimes necessary, especially in those children who cannot be treated satisfactorily otherwise.

For securing local anesthesia of the nose externally, the nasal fold is located by raising the ala of one side with a rake retractor, and then a 2 inch 24-gauge needle with syringe is placed at the center of the fold. With the overlying skin of the nose pinched up by the finger and thumb of the free hand, the needle is advanced under

The subject of instruments is fully considered in Chapter 9.

Infection The nose appears to be somewhat resistant to infection, as it occurs comparatively rarely when preoperative measures have been rigorously carried out Nevertheless, a nasal operation should not be done in the presence of coryza or of a focal infective area Disregarding this general rule, the writer has operated successfully on patients with long-standing sinus infection, and also on those with ozena Safian also has reported success in operating in the presence of both ozena and sinus disease. In general, however, a plastic operation in these circumstances should be undertaken only in case of serious necessity and the patient should be made aware of the condition

POSTOPERATIVE CARE

When an operation on the nose has been completed, the patient's face should be washed well and dried carefully with sterile surgical sponges The nasal cavities are cleansed of blood clots and mucus by means of cotton applicators wet in hydrogen peroxide followed by dry swabs

For postoperative packing a gauze is used (Nu-Gauze) This is impregnated with sulfathiazole and kephrine hydrochloride The sulfathiazole acts as a bacteriostatic, and the kephrine hydrochloride exerts a mild hemostatic action by means of its vasoconstriction Its effect is less in degree than that of epinephrine, but it is more prolonged and coagulation time is not affected Sterile preparations of this gauze may be used either dry or lubricated If the dry preparation is used, it does not require tight packing, but the lubricated form does, in order to prevent it from slipping and also to keep it in contact with the tissue surfaces If bleeding is profuse, the dry gauze is preferable, but with only slight oozing, the other is preferred Since the activity of this preparation of gauze may cause tissue injury from inhibition of ciliary action, its use should not be continued longer than forty-eight hours at a time

A plastic transparent mold which can be formed to fit the individual feature lines is used externally It is attached with scotch tape, and has the advantage of avoiding repeated disturbance of the dressings, since it permits a clear view of the field without subjecting the delicate cartilages to possible injury

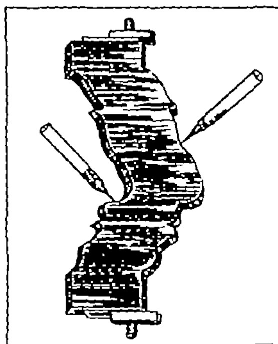


FIG 14 Gauge record of profile mask.



FIG 13 Profile gauge (Stockton) applied to wax mask

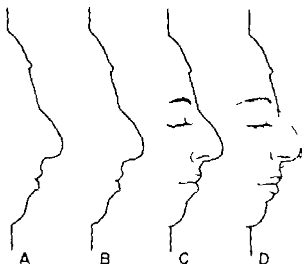


FIG 15 A, B and C are line drawings reproducing the pattern of the profile gauge D represents the approximate correction to be made.

The foregoing is an outline of general procedure Special methods are given consideration under succeeding individual operations in relation to special requirements

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The patient is required to lie on the back in a semi Fowler position (raised at an angle of 30 degrees) without pillows and with the head held in position between sandbags Absolute quiet is required no talking or laughing should be permitted The diet dur



FIG 16 Plexiglas mold

ing the first few days is restricted to liquids or soft solids to prevent stress or strain on the undermined musculature which might result from mastication The sandbags are removed after forty-eight hours. On the fifth day the dressing should be changed. The mold is removed and the nose is given careful inspection then redressed with adhesive but without the mold Sutures should be removed from the fifth to the sixth day At the end of a week or ten days, the swelling and discoloration about the eyes should have disappeared.

the mold slowly with tilting from side to side until the inner surface is covered with a plaster layer from ⅛- to ¼-inch thick. This can be reinforced by adding a layer of gauze dipped in liquid plaster. When the cast has hardened, the mold is chipped away with care by use of a chisel and a wooden mallet, the nose being the last part to be uncovered

The writer proceeds to make a facial mask in the following manner:

1 The patient lies flat on the operating table, without a pillow,

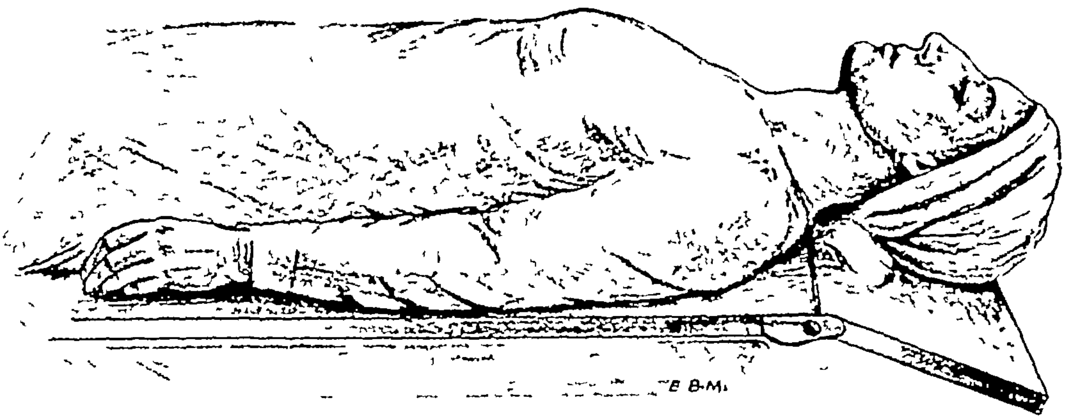


FIG 17 In making a mask, the patient lies flat on the back with the head slightly inclined backward

but with the chin slightly raised (An adjusted dental chair may also be used)

(a) A towel is wrapped round the head to cover the hair entirely

(b) Special thin wooden frames have been devised, with an oval opening which fits closely round the face There are three sizes of frames, thus providing large, medium and small ovals When adjusted this frame leaves only the face exposed and serves as a support for the margin of the mold The frames are rubberized and cushioned round the opening for comfort and for close fitting

(c) Petrolatum is applied to the subject's eyebrows, eyelids, nostrils and lips (Application of the ointment to the entire surface is practiced by some operators, but it has been found that the plaster adheres only to the hairy parts)

(d) A drop or two of mineral oil is put in each eye

(e) To ensure unobstructed breathing, a cylinder of stiff paper or cardboard is inserted in each nostril These are shaped round the tip of a pencil to give them a slight cone shape and are covered

8

Making a Facial Mask

A mask is useful in a number of ways when reconstructive operations are made on or about the nose With care and some experience they can be made quickly and easily

Masks are often made of plaster of paris. This is gypsum (calcium sulfate) which has been calcined at a temperature between 100 and 200 degrees C. until three fourths of its water is lost, when it appears as a white powdery substance When water is then added crystallization takes place in the form of slender needles which interlace to produce a solid white absorbent mass.

There are different grades of plaster of paris which have individual qualities The length of time required for hardening (setting) varies among such preparations The grade used by dentists sets within 5 minutes other grades which are equally useful in making a facial mask require from 20 to 25 minutes for setting *The word setting does not signify drying but only a hardening* that allows handling Hardening can be accelerated by the addition of sodium chloride or retarded by sugar The time of hardening is also influenced by temperature At 40 degrees F the mixture requires three times as long to set as at 125 degrees F

A general rule of some importance is that plaster of paris should always be kept in a dry place

Although plaster is probably most frequently used the materials employed for making facial molds are a matter of personal choice and experience Molds may be made by applying to the face a thin layer (about 1/8 inch) of a melted wax mixture or of dental moulage reinforced with an outer layer of plaster of paris.

The cast may also be made of either wax or plaster In the latter case a separating medium must be applied to the inner surface of the mold before casting This medium may be gum mastic dissolved in amyl alcohol or banana oil in acetone or one of many other serviceable substances The thin plaster is then poured into

with adhesive tape to hold them in this form Before insertion into the nostrils they are lubricated with petrolatum Particular care must be taken that the natural contour of the alar regions is not distorted or enlarged in this process. If there is marked obstruction of the nasal passages, a tube suited to the condition is inserted to ensure adequate breathing

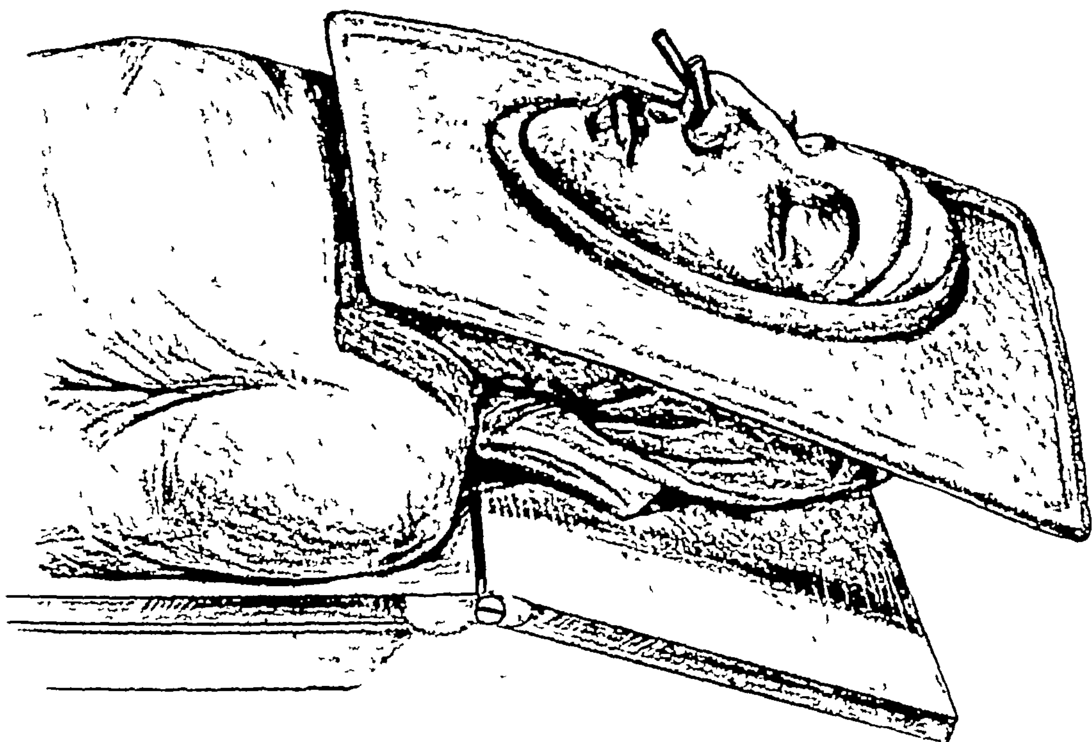


Fig 20 Taking a mask The opening in the cardboard frame is adjusted to expose that part of the face for which the mask is to be made Pieces of rubber tubing are placed in each nostril to ensure free respiration

The patient is instructed to allow the facial muscles to remain entirely passive during the procedure, to avoid smiling, grimacing or otherwise changing the facial expression

2 Preparation of the plaster mold (negative)

(a) Two basins and a large wooden spoon are provided

(b) Four cupfuls of plaster of paris (any quality is suitable for this purpose)

(c) Slightly warmed water is added, stirring constantly until a smooth, creamy consistency is reached Stirring is continued while small quantities of the plaster are applied with the spoon—first over the chin and the lower part of the face, then the forehead, on over

Fig 18 Towel wrapped tightly around the head in making a mask so that the liquid plaster will not get into the hair

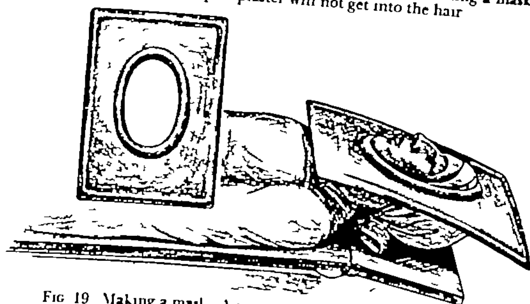


Fig 19 Making a mask. A rectangular piece of cardboard of suitable size in which an oval is cut to fit the outline of the face is bound both on the inner and outer edges with rubber tubing This frame is adjusted with the chin free of the chest, so that respiratory movements will not affect it.

the eyes and, lastly, the nose, the addition of plaster being continued until a layer about an inch thick has been applied. The plaster must then be allowed to set (harden) The action of hydration of the plaster evolves a certain amount of heat, which may be relieved or cooled by fanning This may be done by hand or by the use of an electric fan The time required for setting varies with different



FIG 23 Making the mold for a mask by pouring liquid plaster over the face, leaving nostrils open

preparations of plaster (5 to 30 minutes), and must be determined by testing from time to time with the finger and thumb If it crumbles, it is not ready to be removed It must be firm and resist breaking when tried in this way As soon as the plaster has hardened, the tubes are removed from the nostrils with forceps to allow freer breathing and so give the patient greater comfort No change in facial posture should be made while the mold is in place

As soon as the desired point in setting of the plaster mold has been reached, it is carefully loosened about the entire periphery

Fig 21 Making a mask. Liquid plaster of paris is spread over the face with a large spoon Any excess of plaster runs off the frame into a receptacle on the floor

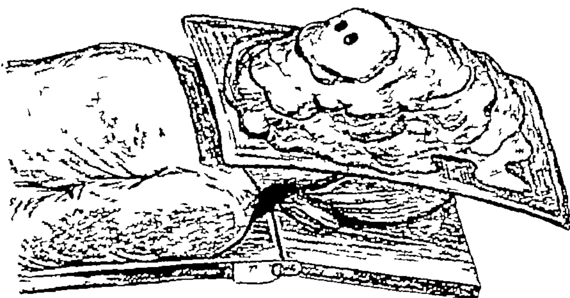


Fig 22 When making a mold the liquid plaster is cooled by using an electric fan while it is solidifying

plaster. Then turning the mold face up, these areas are built out with thin plaster applied drop by drop until the desired effect is secured

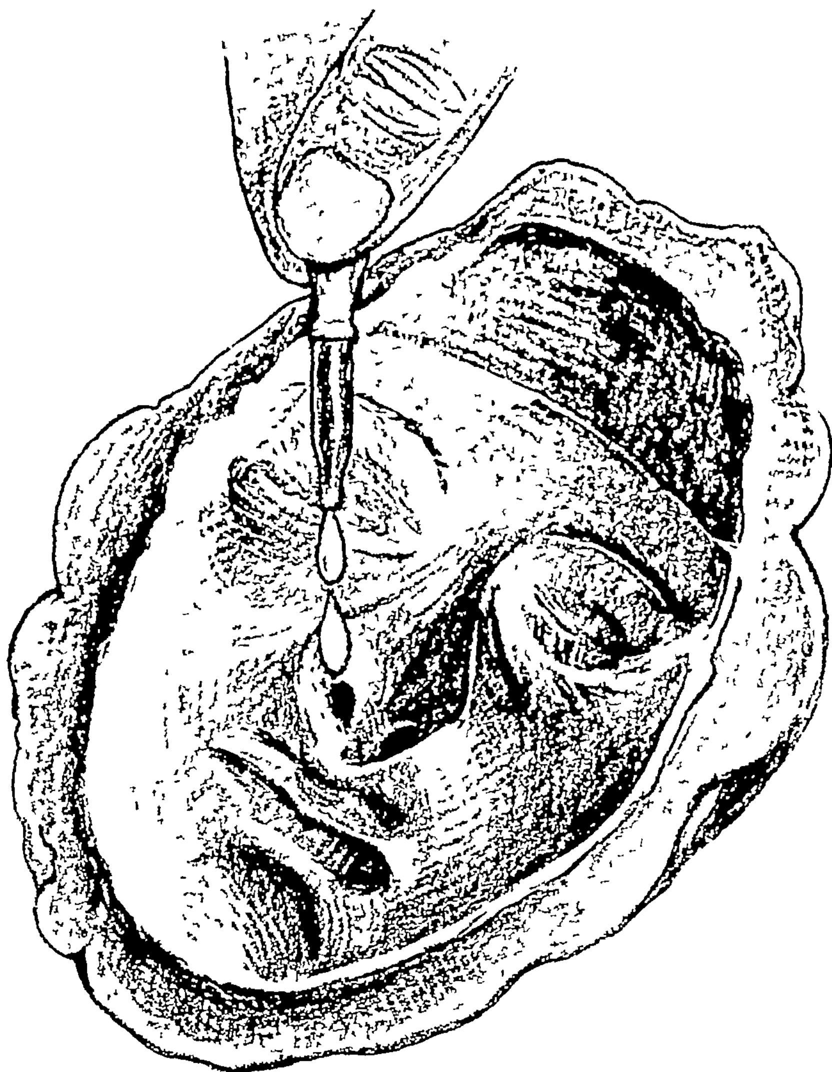


FIG 25 Liquid plaster is dropped into the nostrils of the mold or cast of the face to close these openings When it solidifies the mask can then be made

(f) The cast is allowed to stand for twenty-four hours or overnight (It is sometimes left for a shorter period—one hour or more —but the longer time ensures better results)

3 Making the wax cast or model (positive)

(a) Pieces of the hard wax are melted in the top of a double boiler

(b) While this is in process the mold is filled with cold water and allowed to become saturated It is then filled with very hot water

There will be some suction because of the process of hardening but with care this should present no difficulty



FIG 24 The plaster mold as it is removed from the face ready to be cast. The nostrils are the only part free of plaster

(d) The subject is assisted to the sink where the face and eyes are thoroughly washed

(e) The mask must be treated to close the holes representing the nostrils After it has stood for about an hour the mask is placed face down on the table and the inner openings are closed with thick

repeatedly filled with the wax and emptied until the layer of wax within the mold is about 3/4 inch thick Then the margin of the wax cast is cut close round the rim of the plaster mold. The wax is allowed to stand until it is thoroughly cooled, when it can be removed easily from the mold Any roughened areas can be smoothed and polished with fine sandpaper

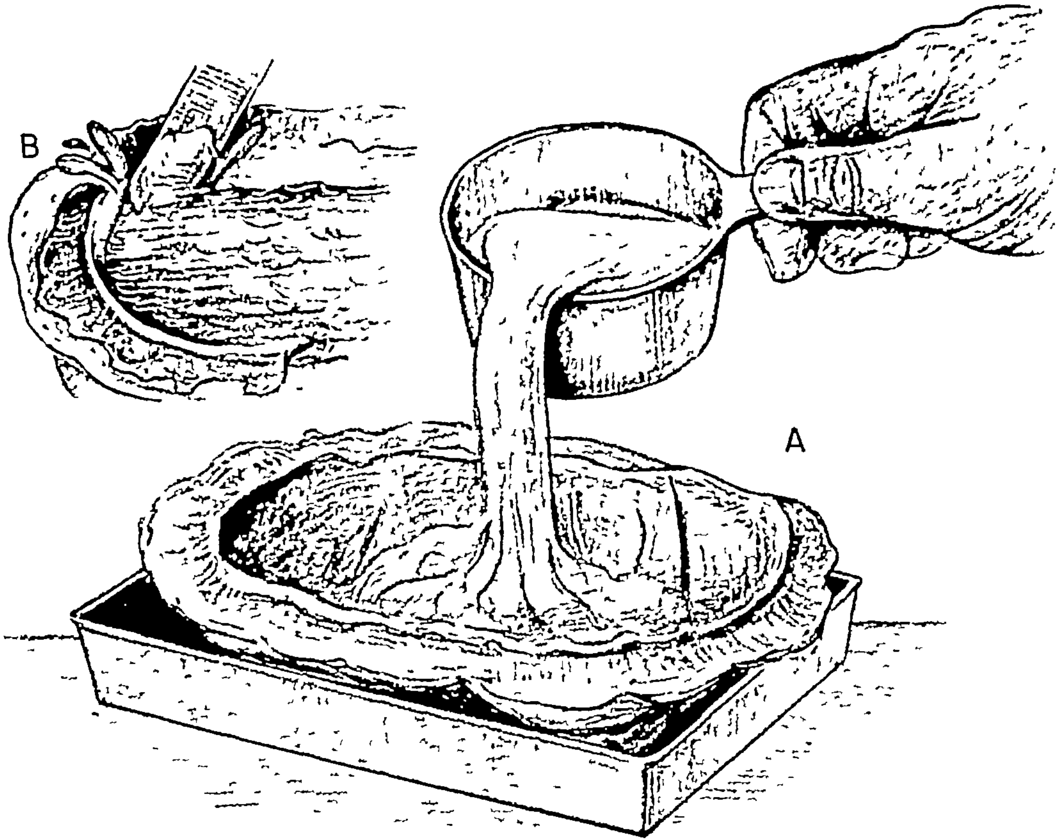


Fig 28 (A) Pouring the hot liquid wax into the mold after the nostrils have been sealed and the mold dried out with absorbent paper or cotton to remove the hot water with which it had been filled (B) The mold filled nearly to the top with hot liquid wax which is splashed up over the brim of the mold to prevent shrinkage away from this edge and so remain natural size

(d) This final step is not necessary, but it has proved helpful After the cast has become thoroughly hardened, it is finished by applying ordinary facial make-up First a base is applied to the entire face of the wax model, then lipstick to the lips, rouge to the cheeks and black to eyebrows and eyelashes

4 It is the writer's custom to make a duplicate model on which, following Berson's method, the nose is reshaped to represent the contour which it is desired to produce The second model can be

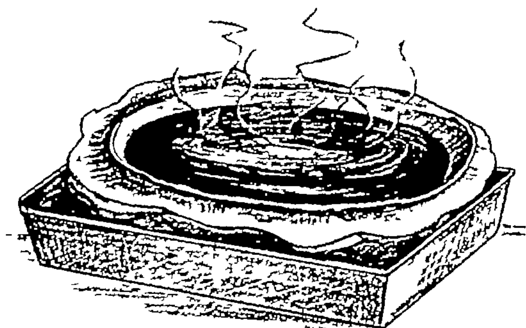


FIG. 26 In making a mask the plaster mold is set in a pan and filled with hot water to prevent cracking when the hot wax is poured into it.

and allowed to stand about five minutes then emptied All excess of water is carefully and thoroughly removed with facial tissues until the mold is well dried out.

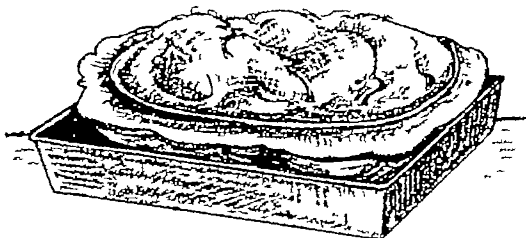


FIG 27 When making a mask all moisture is removed from the mold with tissue paper or absorbent cotton after pouring off the hot water

(c) The melted wax is poured into the plaster mold while the latter is still warm and spread over its rims with a tongue depressor The liquid wax is then returned to the top of the double boiler This should leave a thin layer of wax inside the mold which is



FIG 30 *(Right)* Direct mask of profile to be corrected *(Left)* Corrected mask showing proposed result of operation

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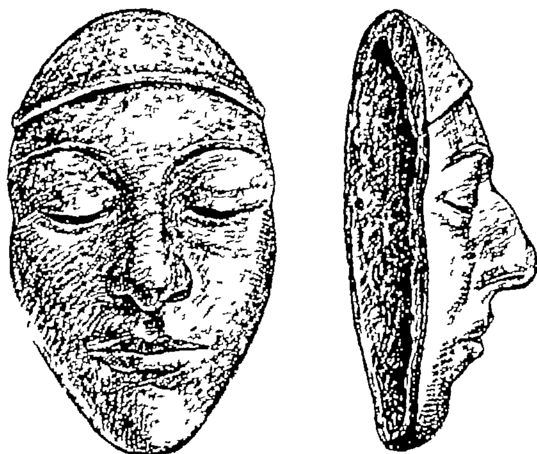


Fig 29 The wax mask front and profile made lifelike by penciling the eyebrows and lashes and adding color to lips.

compared with the original one and may be shown to the patient to give an idea of the possible final result of operation The patient is told frankly that no definite promises as to outcome can be made but that everything possible will be done to achieve a successful result.

Six weeks after operation a mask is again made and is kept for a record

The cast model serves not only for permanent record of repair or reconstruction but is also a definite help during the operative procedure It can be referred to from time to time as the operation proceeds and act as a guide from one step to another Satisfactory results are rewards for the time and effort expended and prove the usefulness of individually cast models

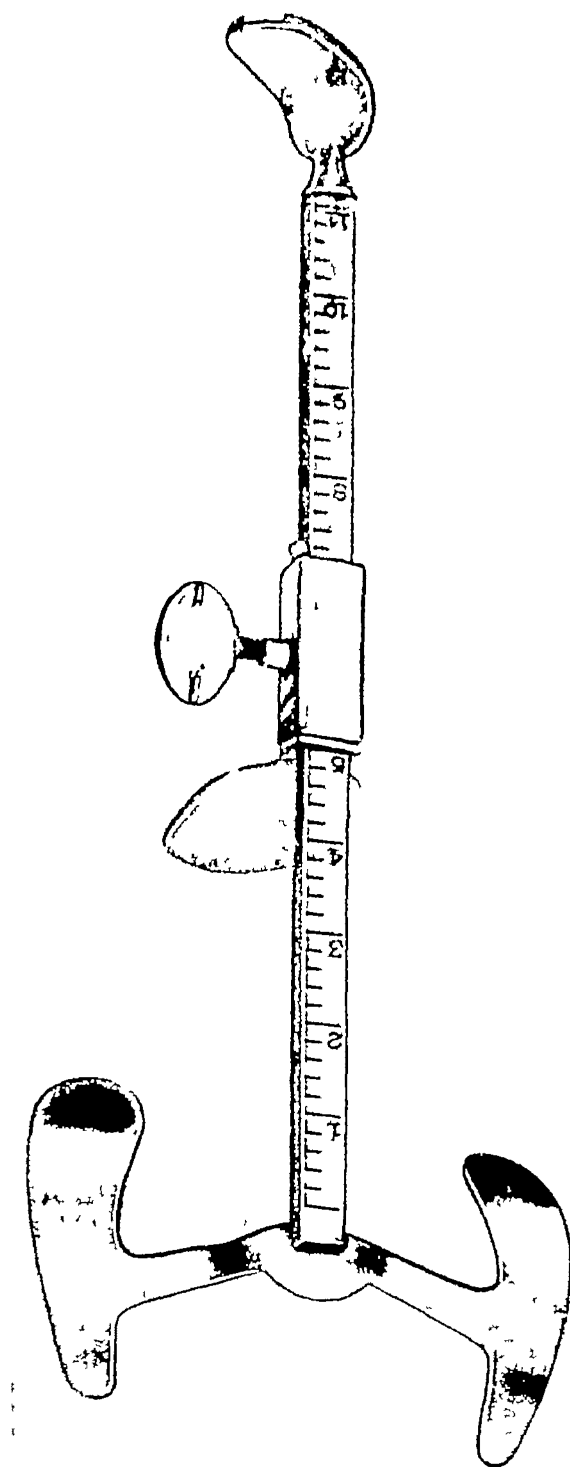


Fig 31 Tiltometer

9

Instruments

The subject of instruments is of particular importance in operations on the nose The limitations of the field necessitate unusual delicacy in all surgical procedures Many operations must be carried out subcutaneously on a field which is not open to view The conditions require a number of instruments, each of which must be exactly suited to the particular step concerned

The following general rules should be strictly observed

All instruments should be (1) of the finest quality of tested stainless or chrome plated steel (2) of simple design (3) kept always in perfect condition (4) carefully sharpened if for cutting (5) well oiled to prevent rust and stored when not in use (6) thoroughly sterilized before each operation (7) chosen especially for the operation to be done and arranged in exact order of use on the Mayo table

It is well for the operator to know how to sharpen all cutting instruments. The writer has learned from an expert maker of surgical instruments how to sharpen surgical knives and to file saws. This additional preparation is often a definite advantage

All instruments should be examined at frequent intervals by a surgical instrument maker to determine needed replacements

CLEANING

Cleaning is done by washing first in soap and hot water containing a cleaner Saws are carefully scrubbed free of all attached fragments, and when thoroughly clean are placed along with other metal instruments in use and sprayed with mineral or some other bland oil

STORING

All cutting-edged instruments are tested for sharpness and then carefully arranged in the cabinet each separate from the other to avoid nicking or dulling

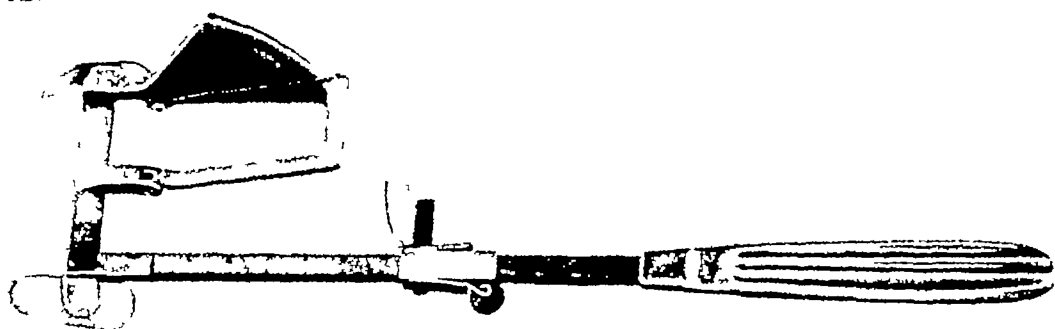


Fig 32 Berson rhinometer

Speculum. The NASAL SPECULUM in its orthodox form continues to give complete satisfaction It is familiar to all rhinologists a simple pair of tapered blades which open out to distend the walls of the nares in any direction It is used to meet almost any need for careful intranasal examination It also helps when the vestibular hairs are clipped off and when intranasal dressings are being applied The writer uses at least three for each case, changing to avoid the possibility of infection It is easily sterilized

THE DOUBLE NASAL SPECULUM is constructed with two valves on either side, the distance between them being just sufficient to admit the nasal septum There is a thumbscrew at the joint with which they can be set at any desired angle. With them, both nasal fossae can be examined at the same time, and any inequalities in size of the passages, their patency for ventilation and the position of the septum can be plainly seen

THE NASAL SPECULUM OR RETRACTOR (AUFRICHT) is a comparatively longer instrument with a heavy, grooved handle The shaft is very slightly curved about midway and then sharply recurved or angulated, beyond which point it becomes a slightly tapering, round-pointed grooved blade with the shallow groove on the outer surface This instrument is used after undermining the tissues over the septum to lift them from the underlying dorsum, by which the septum and the nasal bones can be seen with the aid of direct light With sufficient elevation the field can be seen clearly and any necessary operative procedures can be carried out in plain view

Retractor A long nasal retractor is divided about equally between handle and a shaft which tapers to end in a broader, sharply curved short expansion, concave fore and aft on its outer surface This slender instrument allows a clear view of the face while the

STERILIZING

Since boiling tends to dull keen-edged instruments (knives needles blades scissors etc.) they are placed in concentrated alcohol saturated zephiran or in a solution of metaphen

Dull instruments such as hemostats retractors forceps rasps, chisels mallets, etc. are prepared for use in the steam sterilizer or in the autoclave

INSTRUMENT LIST

Each operator has certain individual preferences in choosing his instruments but there are a number that are always needed for use in routine work

Tiltometer The tiltometer is a device for use in operations for shortening the nasal dorsum It consists of an upright metal shaft on which is an 11-cm scale graded to millimeters At the upper extremity there is a roughly H shaped crosspiece curved to fit the supra-orbital ridges At the lower extremity is a small flat oval extension set at right angles for holding in the desired position with thumb and finger On the main shaft is a sliding arm with thumbscrew which can be set at the desired distance from the glabella. Having determined the new length of the external nose the length of the septal cartilage which must be removed is measured with an accessory centimeter scale in the form of a narrow metal measure mounted in a handle to which it stands at an obtuse angle When the suitable length of the septum is decided a nick is made with a knife and the cartilage is cut through and through

Rhinometer The Berson rhinometer consists of a heavy millimeter upright scale about 14 cm in length and 0 5 cm square At its upper end is a crossbar which carries small narrow oval plates at either end. In measuring the nose these plates rest upon the supra orbital ridges There is an anteroposterior recording scale at the left with a hinged indicator On the upright, there is a movable attachment adjustable by means of a ratchet wheel with which the perpendicular length of the nose can be measured The attached platform can also be used to raise the tip of the nose to a suitable angle that can be definitely measured by the scale on the upright. The angle of the nose is determined by using the anteroposterior scale.

where exact undermining is needed in preparation for using the right- and left-angled saws Its only fault is the lack of a bar across the angle to give it greater strength

Knives BARD-PARKER KNIVES are specially characterized by their detachable blades Number 11 has a sharply pointed blade on one side it is straight throughout its length, on the other it tapers at a sharp angle and is unbellied to the pointed tip The blade is detachable and is held in place by a special clamp mechanism. This knife is best suited for cutting which must be done with a sawing movement It is not used as is the ordinary scalpel in general surgery A clean cut can be made with it and without frayed edges One precaution should be observed the point of the knife should be guided to make sure that the overlying skin is not perforated.



FIG 33 The Bard-Parker No 11 Knife

The Bard-Parker Number 15 knife also has a detachable blade which is only ½ inch long It is curved to a short, broad tip and makes a definite belly at the curve This blade is used primarily for operating on the lower lateral (tip) cartilages The writer also uses it to undermine the vestibular skin This can be done without puncturing or fraying the tissues This knife also serves well to slice off irregularities of cartilage It is easily guided, and the belly of the short blade is often preferable to a sharp point, as in the Number 11 or other knives

JOSEPH'S DOUBLE-EDGED KNIFE has a sharp point, is beveled on both surfaces and is slightly curved on the flat This knife is used for the primary intranasal incision and is entered always with the point downward, not only to avoid perforation of the skin but to penetrate and pass below the subcutaneous tissues This should be done as deeply as possible, so that the skin circulation shall not be in any way impaired This is of special importance Having reached the desired subcutaneous level, the knife is rotated from side to side as on a pivot, slowly and persistently, until a sufficient tunnel has been made beneath the subcutaneous layers

alar rim is being lifted to expose the lower edge of the upper lateral cartilage where the primary intranasal incision is often made

A heavy pronged retractor is made of a single piece of flat metal about 1 cm. in width The proximal end is curved to fit the little finger easily and there is a slight bend at the point which corresponds with the grasping thumb and forefinger At the distal end are two heavy recurved, blunt prongs on either angle This instrument serves for retraction of the nasal tip to expose the septum and is used in operations on the anterior spine of the maxilla Its freedom from sharp edges and points avoids tissue injury

Dural hooks, or retractors may be either single or double They are very fine delicate hooks which terminate a slender metal rod The double type has a U shaped terminal with fine, sharply recurved tips the single hook is finer and shallower The latter is used for delicate operations about the nasal tip in dealing with fine incisions and thin tissues the former can be used for elevating the tip of the nose Both are particularly suited for manipulation where tissue injury must be particularly avoided

Elevators. THE MCKENTY ELEVATOR has a small thin handle finely cross-grooved to afford a firm hold with thumb and forefinger It carries a thin blade which is flat on one surface and oval on the other The tip is thinned out to a moderately sharp edge which curves slightly toward the flat side This elevator is used following the primary intranasal incision only as a guide to the periosteum After the skin incision has been made and undermined upward to the lower border of the nasal bone the McKenty elevator is then introduced with the curve of the blade downward under the periosteum where a shallow pocket is made and is enlarged by means of another periosteal elevator

JOSEPH'S PERIOSTEAL ELEVATOR has a slender oval pointed tip which is slightly curved on the flat This instrument is used to increase the subperiosteal pocket begun with the McKenty elevator With it, the membrane is separated from the underlying bone as in the process of removing a nasal hump A scraping sound can be heard as the periosteum is pulled away from the underlying bony surface

RIGHT AND LEFT ANGLED periosteal elevators have a sharply angled shank which is recurved near the terminal narrow expansion This elevator is of particular use along the superior process of the maxilla

A BUTTON-END CARTILAGE KNIFE, with which Malniac's name is associated, has a very heavy handle which continues in a short, stout shank bent at an obtuse angle and ends in a 1½-cm beveled double-edged blade with a button end It is used for trimming cartilage and for smoothing off rough edges

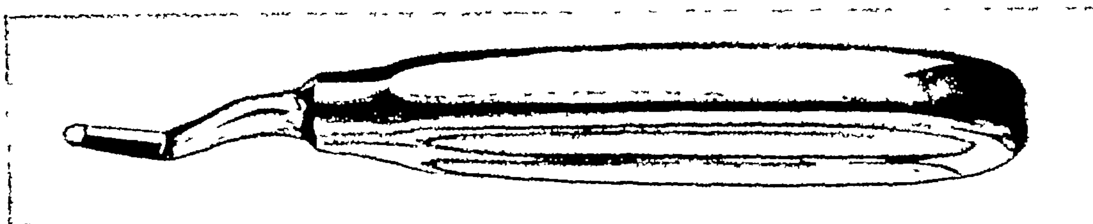


FIG 35 A button-end cartilage knife (Malniac)

Saws. The fine-toothed bayonet saw (Joseph's) is made for both the right and the left hand Between the handle and the saw blade there is a short segment which is finished as a sharp cutting blade on one edge After the periosteum has been completely separated over a nasal hump the left saw is inserted into the pocket and the bony parts are sawed through Excision of cartilage can be made by means of the short knife edge described above After long experience, the writer has come to use only one saw for the entire operation of hump removal (*see* "A Typical Rhinoplasty," in Chap 11). Other surgeons may find it preferable to use both right- and left-hand instruments for the separation of bone on the corresponding sides

The right-angle saw of the bayonet type has a right angle in the shaft an inch above the handle To withstand the pressure exerted in its use, it is advisable to have the angle reinforced by a bar of the metal This gives the strength needed to avoid breakage

There are both right- and left-hand saws, for use on both sides of the nose, to cut through the superior process of the maxilla, which is done with a to-and-fro motion

Scissors HEAVY LONG-HANDLED SCISSORS with short, sharply curved blades are used for removing projecting parts of the upper lateral cartilages This procedure is necessary in an operation to shorten the nose All parts of the nose must be reduced in proportion to maintain harmony of line and form

KNIGHT'S ANGULATED SCISSORS have short, blunt blades They are used particularly for separating the upper lateral cartilages from

THE BUTTON END KNIFE has a narrow blade which ends in a blunt expansion as its name implies Its special use is in removing a hump to separate the framework of the nasal dorsum from the over lying tissues. The thickened tip of the knife prevents injury to the soft parts when making a to-and fro cutting movement. It is also used to separate the lower border of the septal cartilage from the membraneous septum and to complete the separation of the severed hump from the underlying bone and cartilage

THE MALTZ KNIFE has a short curved blade with the cutting blade on the inside of the curve This blade is duplicated in shape by another which is fitted beside it but which has a dull edge There is a space between them of about 1 mm in depth and the tips are fused to form a button end This knife is designed for use in



FIG. 34 The Maltz knife

smoothing off the dorsal surface of the septal cartilage following an excision It is inserted through the intranasal incision to the upper extremity of the septal surface then brought gradually and carefully downward It ensures a section of uniform thickness and a smooth dorsal contour

THE TRELAT KNIFE is paired for both the left and the right hand It has a thin beveled blade with a cutting tip which is acutely angled on the side and also slightly angled on the flat with the cutting edge inside the angle When in use the right hand knife is held in the right hand and inserted through the intranasal incision to smooth off the septal cartilage and also to undermine the subcu taneous layers preparatory to the insertion of a graft in operating for saddle nose The left hand knife is used similarly on the left side of the nose

FOMON S DOUBLE EDGED KNIFE has a beveled blade curved on the flat with a rounded tip It is a modification of Joseph s double edged knife which has a pointed tip It is useful after Joseph s knife for undermining subcutaneous tissues where a sharp point is not necessary

They are also used in packing the nose with gauze strips to prevent blood from reaching the nasopharynx

BAYONET FORCEPS are used interchangeably with those just described, differing mainly in that they are double-angled to raise the points above the level of the grip, but parallel with it

MEDIUM HEAVY SPRING FORCEPS are used particularly for holding the skin firmly and without injury

LIGHT, FINE MOUSE-TOOTHED FORCEPS are used for holding the small cartilages, particularly in dissecting the nasal tip This type can be used variously, as for removing sutures after operation

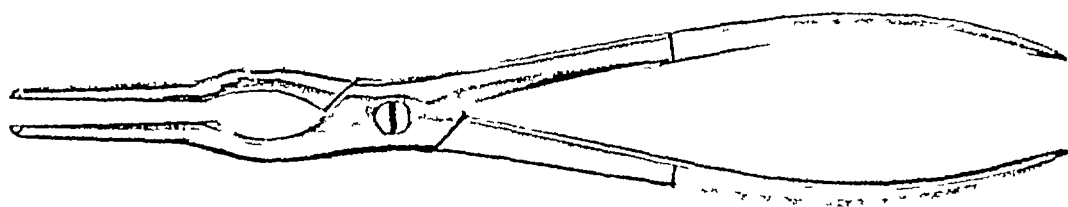


FIG 37 Walsham septal forceps

SEPTAL FORCEPS (WALSHAM) are large and heavy Beyond the joint, the relatively short blades follow a shallow curve about 3/4 inch in length, then taper slightly, with flat inner surfaces, to meet in rounded tips Walsham forceps are used on a particularly resistant nasal septum which fails to yield to other methods Both blades are introduced preferably through the vestibule on one side, then twisted and turned into the desired position They are sometimes used by entering one blade in each nostril, but the writer has found this method less desirable These forceps are held with the curve of the blades either up or down, depending upon the requirements of the immediate operation

HEAVY ANGLED FORCEPS, with strongly cross-hatched tips, are particularly well adapted to the removal of a nasal hump after it has been separated When grasped firmly, the loosened bone can be drawn out easily

Columellar Clamp (Seltzer) This may be made of stainless steel or of chrome plate At the distal end of a shaft, which is a continuation of an ordinary knife handle, there are small recurved prongs on either outer angle A sliding attachment with similar prongs curved toward those at the tip is mounted on the shaft, and is adjustable by means of a thumbscrew There is an excursion of motion

the septal cartilage The angulation of the handles is at a suitable degree to facilitate this operation

THE GILLIES scissors are characterized by having one handle shorter than the other With the thumb in the ring of the longer side and the middle or the first finger in that of the shorter the hand is in a particularly natural position for a firm and easily con trolled grasp The blades which are sharp near the joint end in cross-hatched hemostatic forceps tips There is no locking device but sufficient spring action at the joint gives moderate pressure at the tips They are convenient for use as hemostats scissors or needle holder

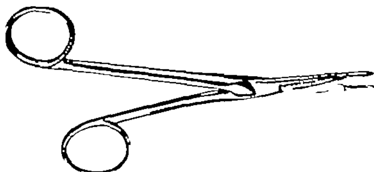


FIG 36 The Gillies scissors.

MAYO SCISSORS are comparatively small and short with blades which are blunt tipped and curved on the flat. They are designed for use in cutting fibrous attachments after the skin has been under mined. They are particularly useful in a hump operation

THREE SMALL SCISSORS which were originally made for use in oper ating on the eye are (a) very fine pointed curved (b) slightly larger straight pointed (c) blunt pointed and curved They are used in operating over the septal dorsum All these small scissors must be kept keenly sharp to ensure success when used. They are particularly useful for freeing cartilage from the soft tissues for trimming off delicate edges of cartilage or for excising vestibular skin. A number of duplicate pairs are a great convenience

Forceps. NASAL FORCEPS are angulated obtusely at about midway their length They are spring forceps which taper to a thin but not a sharp finely ridged tip These forceps are used to reach the deeper parts of the nasal fossae They are adapted to holding tissues for any purpose since they are not toothed they cannot cause injury

Rasps. THE COARSE RASP ends in a short, cross-ridged expansion, which is rounded at the top

A FINE RASP has diagonal cross ridges on a narrow flat shaft, similar to the surface of a file

Rasps are used in removing a hump to smooth the roughened edges of bone following the use of the saw They can also be used to make the sides of the septal dorsum equal and even When using a rasp, pressure should always be exerted on the downward stroke The coarse rasp is first inserted and applied to the freshly sawed bony edge, carrying it upward as far as possible, then with a quick but firm movement the rasp is brought downward and outside, bringing with it the material which has been removed When the

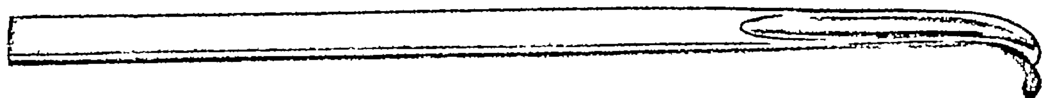


FIG 39 Grooved director

excess of the bony irregularity has been smoothed with the coarse rasp, the finer one is used to complete the smoothing process

THE GLABELLAR RASP has a terminal expansion ⅞ x ⅜ inch, with a rounded end It is slightly curved with medium coarse ridges on the convex surface This type of rasp may be either coarse or fine The glabellar region of the nose is sculptured with these rasps by inserting them into the prepared intranasal tunnel and carrying them up to the root of the nose The desired curve in the bone is reached by making a firm, quick downward movement

Kelly hemostats are fine and cross-ridged at their tips, which are slightly curved in the flat plane These forceps are particularly useful for removing the separated bone in the hump operation They should be inserted through the intranasal incision, the loosened hump grasped firmly, and then, instead of immediately pulling downward, which may invaginate the skin, if it is still attached, a slight, quick push is made upward to free all attachments and then the hemostat can be withdrawn with the grasped bone

Directors. A heavy strip of metal with the distal end curved for ¾ inch at nearly a right angle The tip is shallow-grooved on the outer surface of the curve It is used chiefly at the point of cutting

of ¾ inch The clamp is used to evert the columella after it has been separated from the lower border of the septum, in operations for columellar narrowing It is inserted through the space between the columella and the septal border the clamp is adjusted to secure fixation with the thumbscrew then the handle is turned through a half circle as a lever everting the strip of columella tissue Held in this way the excess of the tissues is removed and the clamp is detached

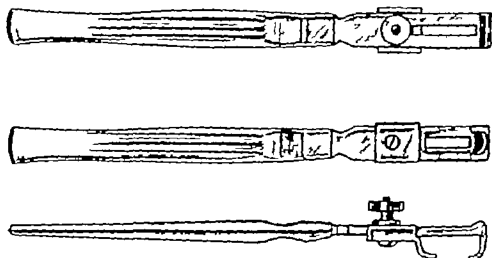


Fig 38 The Seltzer instrument for reducing the columella.

Chisel. A 15-cm all metal chisel with a 1-cm cutting edge is used for separating the parts in making bony incisions Its breadth helps to avoid injury by perforation of soft tissues which may occur with a narrow chisel Its extra strength is also an advantage in using leverage in bony operations

Mallet A mallet should have a heavy handle which can be easily grasped. The writer prefers a metal bound vulcanized rubber head This tool is used with the chisel after bone has been sawed through to complete the separation of the parts The mallet is also used for separating the septum from the nasal bone A characteristic vibration can be felt with this mallet when the chisel strikes into the bone which is absent with a solid metal mallet There is also a characteristic resonance of tone which can be differentiated

either side of the midline there are attachments with adjustable thumbscrews, each of which carries a heavy wire with an oval metal plate lined with hard rubber on its lower end. The positions of these adjustments are controlled on each side by horizontal screws in binding posts, and are regulated by a key. The associated actions of these adjustments is to exert counter pressure on a deflected nose to bring it into the midline. It is designed to be used once or twice a day for about half an hour until the desired position is established.

A Seltzer nasal lifter (made up by Lentz & Co.) is an attachment to a headbrace. It consists of a 3-mm. metal rod about 15 cm. in length, midway it is double-angled and on the distal end is a U-shaped attachment of finer wire, the tips of which are knobbed and recurved. This tip is adjustable by means of a thread in the rod over which its fits. When attached to the binding post of a headband, the cotton-padded terminals are hooked into the nostrils and the nasal tip can be lifted by the screw adjustment.

The Kasanjian splint is an all-metal device which consists of a wire browpiece, to which are attached two adjustable wire arms with small rectangular metal plates for terminals. It should be taped and covered with a layer of soft dental composition. When applied to the skin, it will remain in a fixed position for from 4 to 5 days, its mobility being that of the underlying skin. Elastic bands are used to exert pressure. Although this apparatus was originally designed for use in fractures of the nasal bones, where lateral support is required, it is also adaptable in rhinoplasty, where similar requirements are indicated.

ACCESSORIES

A metal brush of fine wire is used for removing bone dust and all debris from the toothed saw edge. If a saw is used which is not entirely clean and free from remainders of a previous operation, particles may be dislodged and cause a foreign-body reaction in a later operation.

The Tamerin saw cleaner has a narrow round-tipped blade about 4.5 cm. in length and very finely blunt-toothed on one edge. When a saw becomes clogged during an operation, the debris in the saw teeth can be removed easily with this cleaner, which must be used only in an oblique direction.

through the superior maxillary processes Inserted into the field, it serves to guide the direction of the saw and steady it so that the overlying skin shall not be torn

A small grooved director is of the familiar design used in general surgery With the distal end bent sharply to form a hook it is of special use in excising parts of the lower nasal cartilage The hook serves to draw the cartilage out of the wound then the knife follows the groove for cutting through the cartilage

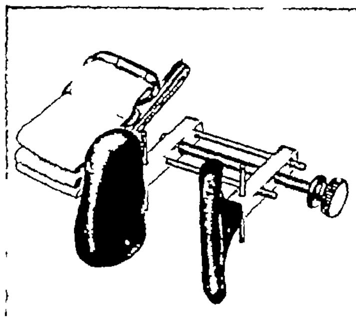


FIG 40 Joseph s brace

Grooved dissectors are relatively large instruments The short shank which continues from the handle is expanded and deeply con cave with a slight curve on the flat The edges are sharp but not keen as the flat tip is There are three sizes according to the caliber of the groove They are used for dissecting out rib cartilage for use in making grafts With the perichondrium elevated the cartilage can be taken out in a single continuous piece of suitable size

Needle. The rhinoplastic cutting edge needle is 6 cm in length stiff and triangular near the long fine point It is used in operations on the columella for reattaching it in a new position to the nasal septum

Joseph s brace corrects deflections of the nose There is a head band to which a leather lined metal browband is attached On

syringe inserted through the stopper at one end, and pressure applied to the rubber at the opposite end, the vial contents are forced into the syringe without the usual piston action This method is easy to use and ensures uniformity of the anesthetic It is also generally convenient

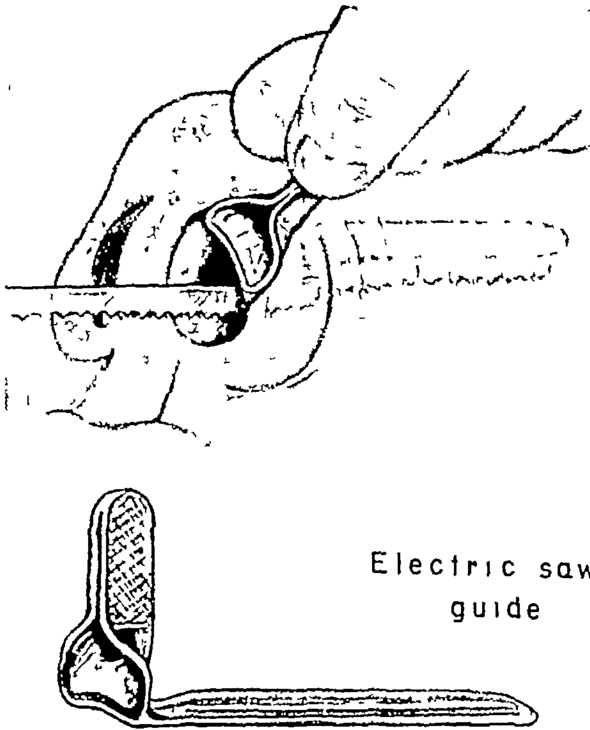


FIG 42 Electric saw guide (author's original) To protect against brush burn of the subcutaneous tissues from the very rapid to-and-fro motion of the saw

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Hone. A hard Kansas oil stone is used for sharpening instruments. It is a very fine-grained hone and gives a smooth sharp cutting edge To sterilize it should be placed in alcohol overnight never boiled and during operation it should be kept conveniently at hand on a sterile table

A metal mirror is useful in studying deformities of the nose from various points of view with change only of the examiner s position. It is especially valuable in determining the uniformity of the nostrils. This mirror is unbreakable and is easily sterilized

The Anesthetic Vial. To avoid possible errors in having local anesthetics compounded it is convenient to buy vials of standard novocaine adrenalin solutions With a needle in a Cook s tonsil

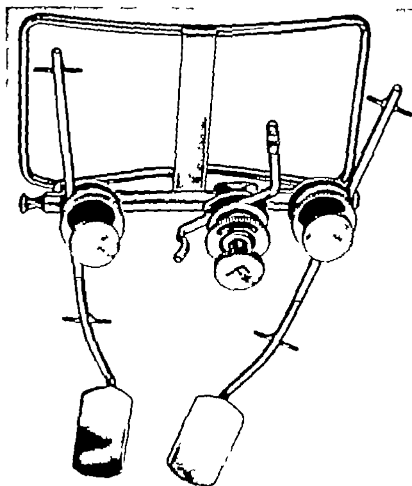


Fig 11 The Kasanjian splint

Cancellous bone from the crest of the ilium, or less often from the scapula, has also been employed as supporting material in nasal operations (Gillies, 1932). This field provides an adequate source of material, and the type of bone also has the advantage of greater ease than denser bone of establishing a vascular supply, which is of first necessity for assured vitality of the graft. The nature of this bone also makes it easier to model.

Cartilage should be theoretically, if not actually, the material of choice for nasal-framework grafting, since the nasal cartilage is the part most frequently destroyed. Cartilage autografts can be secured easily from the synchondrosis of the seventh, the eighth and the ninth ribs, where there is an abundance of material.

The autogenous cartilage is not absorbed as bone may be and it can be modeled easily (Young). Autografts should always be used in children, if possible, because of the potentiality of growth of these grafts (Peer, 1944). Homografts can be used if the patient's condition contraindicates removal of his own cartilage.

These grafts may be used in the fresh state or they may be refrigerated. In the latter method, fresh cartilage is wrapped in gauze which has been moistened with sterile saline solution, alone or combined with an antiseptic, and kept in the icebox.

Cartilage from recent cadavers has also been used successfully after being treated in a similar way.

The cartilage throughout the body is chiefly the hyaline variety (*hyalos* glass). Costal, respiratory (trachea, bronchi, etc.) and articular cartilages are hyaline. Fibrocartilage is limited mainly to the intervertebral discs and the symphysis pubis.

Hyaline cartilage in the gross fresh specimen appears as a homogeneous substance. It is (1) flexible, (2) slightly elastic and (3) semitransparent, with bluish opalescence. Except in the joint spaces, it is surrounded by a firmly attached layer of vascular connective tissue (perichondrium).

Histologically, hyaline cartilage is composed of a homogeneous matrix in which characteristic cells are embedded. By special staining technics, fine fibers can be demonstrated running in all directions to form a feltwork. But since such fibers have not been identified in fresh tissue, the question seems justifiable as to whether these fibers may not be similar to those which can be demonstrated

10

Grafts and Their Preparation

In rhinoplasty grafts are used for reconstruction where there is maldevelopment or loss of tissue

Two main classes of grafts are required in these reparative operations (1) To act as supporting framework for the nose (2) to serve for surface cover

These two groups are subclassified according to the source of the graft (1) Autografts (isografts) taken from the person s own body (2) homografts which are transplants from other human sources (3) heterografts which include a variety of nonhuman materials

There are two rules in plastic surgery that are axiomatic (1) All grafts should be as nearly as possible of the same type as the original tissue (2) autografts give best results

GRAFTS FOR SUPPORT

The great variety of substances which have been used for artificial nasal framework have been considered in a previous chapter Consideration is given here only to those which are in most common use and others which are in process of being tested

Bone has been used as graft material by many operators It is most frequently taken from the anterior border of the tibia where the supply is sufficient to answer any demand of rhinoplasty The characteristics of this dense type of bone make it not entirely desirable as graft material Bone will often become vital only when it is placed in contact with other bone tissue throughout its entire length In the nose the bone graft comes chiefly in relation only with the nasal bones Although preserving the periosteum of the bone graft intact may help to some extent, it does not ensure entire success Other disadvantages of bone are that it is relatively difficult to shape accurately and it may cause foreign body reaction and be expelled Bone also makes a rigid framework for the nose which normally has a degree of mobility This rigidity increases the possibility of injury to the nose with resulting destruction of the grafts.

taneously either in the loose tissue below the breast or in the groin, where it can be stored for later use.

The method followed by the writer (that of O'Connor & Pierce) is to remove the perichondrium from the piece of cartilage and wash it thoroughly in tap water, then place in a solution of 1 part of aqueous merthiolate (1:1000) to 4 parts of sterile normal saline solution, which should rise above the specimen at least one inch. The container is then kept in the refrigerator and the solution is changed twice a week for two weeks, then only once a week. Other cartilage should not be added until it has been similarly treated. Whenever the cartilage is to be used, a culture should be taken to determine whether the material is sterile. With this method, parts have been used as soon as twenty-four hours after being placed in the solution, and also as long as two years later. Best results are given if the cartilage has been at least one week in the solution.

Shaping the Graft. This procedure is much the same, whether bone or cartilage is considered. The graft material is held firmly, but carefully, and is sculptured with bone-cutter or knife to fit the need of the individual case, following general lines of preparation. Periosteum is removed from bone and perichondrium is stripped from cartilage to aid in the prevention of curling.

The board used by the writer in the preparation of grafts is described in Chapter 13. While the graft material is held firmly with forceps, it is sculptured to correspond exactly with the wax cast of the reconstruction which has been prepared. The under surface of the graft is shaped to fit closely into the area where it is to lie, and its tip and sides are cut in a similar way to conform to the contour of the inner surfaces of the bed. All corners are carefully removed to avoid irritation of the soft tissues which will surround it (Seltzer, 1944).

A less exactly fitted nasal splint, which is often used, may be made from either bone or cartilage. The graft material is sculptured to a slender triangular outline, pointed at either end with a lateral angle at a point about two thirds of its length. Here a small triangular piece is cut out which allows bending of the graft to form roughly a right angle. A small piece of perichondrium is left over the tip of the angle and also over the end of the graft which is to be in contact with the anterior inferior nasal spine. The writer has

also by special staining methods in coagulated blood plasma which is fluid *in vivo*

According to the findings of most observers independent regeneration of cartilage does not take place after a wound or after the excision of a fragment of living hyaline cartilage in adult mammals The defect is filled in by new connective tissue cells which grow in from the perichondrium These fibroblasts round up with the formation of pericellular capsules peculiar to cartilage cells and appear as new cartilage elements formed by metaplasia of connective tissue

Securing Graft Material. Removal of the bone or cartilage for graft purposes is done under local anesthesia and with strict observance of all customary surgical precautions An exact piece of bone the dimensions of which have been already determined can best be excised with the osteotome

When taking bone from the iliac crest, it is recommended that the required graft be accurately designed beforehand and that only the material needed for the model be removed rather than the entire crest, which is difficult to sculpture when separated and results in greater difficulty in the healing of the hip wound

The operation (Mowlem 1938) is performed by elevating the hips somewhat with a pad or sandbag An incision is made over the anterior third of the crest, about 2½ inches long The bone removed with the osteotome should measure from about 1½ to 1¾ inches in length and ¼ inch in width—not more Care should be taken not to cut nearer than ¾ inch to the anterior superior spine. Sharp edges of the ilium should be smoothed before suturing the muscles and fascia to their original attachments The bone cavity is then drained and the skin incision is closed It is considered a simple operation and should be without complications It is preferable to the operation for removing rib cartilage as there is less possible danger It is also less painful since the field can be immobilized.

Removal of cartilage for grafts is not difficult, but precautions should be taken to operate on the right side of the chest, to avoid any possible immediate or later injury to the pericardium Especial care should also be taken to ensure the integrity of the pleura Somewhat more material is customarily removed than what is needed for the immediate operation The excess is buried subcu

A slight variation from the usual technic (similar to that used with minced cartilage) is to remove thin shavings from the outer surface of the iliac crest, which are used to overlay the minced bone when it is placed in the subcutaneous pocket and lie just beneath the skin Dressing and after care are practically the same as in other similar methods (Barsky)

GRAFTS FOR SURFACE COVER

In the use of skin grafts the same general laws obtain as in the case of bone Autografts have been found to be the only dependable material The most important point in grafting is that the graft shall "take", that is, live and grow as an incorporated part of the tissue by which it is surrounded The actual reason for a lack of take is still obscure, and a great variety of means has been used to favor it As illustrations of what has been done, there have been sieve grafts of perforated skin (1922), tunnel grafting with both thin and thick skin (1930), implantation of small bits of skin into or beneath granulating tissue, weaving a fine strip of skin in and out of granulating tissue by means of a needle (1926), application of pulped epidermis to a denuded surface (1895), skin over a blister artificially caused by a vesicating agent (1879), etc

More recently efforts have been directed toward using the principles of tissue culture to aid the take in skin grafting For these tests, heparinized plasma (Sano, 1943) has been painted both on the site to be covered and on the under surface of the graft After placing the graft, temperature is maintained at about 50 degrees C by renewed hot compresses, with slight pressure to favor fixation At the end of twenty-four hours, the field is dried of all accumulated moisture, and within forty-eight hours the graft should become vascularized

Similar experiments based on the importance of fixation of the graft for early vascularization and successful take have been carried out with the use of a combination of plasma and thrombin, which precipitates fibrin when introduced between the graft and the underlying tissue (Young & Favata, 1944)

Barsky considers that Langer's lines are important to graft success

Langer's Lines Dupuytren (1886) first made the observation that when the skin was pierced with a round sharp instrument the wound was not round but linear He also observed that the direc-

varied this technic by dividing the graft entirely at the angular point then the shorter arm is mortised into the corresponding end of the longer arm This technic helps to prevent curling of the graft (Seltzer 1943)

Great care must be taken to avoid any source of infection and since graft material is somewhat difficult to handle, it should be kept on a table or tray with a walled border to prevent it from sliding or slipping out of bounds

When the graft is finally ready it is inserted into the pocket or placed on the prepared surface as the case requires according to methods already described which include suitable dressings and after care

Comminuted grafts of both cancellous bone and cartilage are also used with good results Autogenous cartilage is minced to particles from about 1/16 to 1/8 inch square These fragments are filled into the subcutaneous pocket which has been previously prepared. The reconstruction is then modeled to correspond with the predetermined pattern An exact mold made of latex or of other suitable material which has been designed on a cast of the face is fixed firmly over the area of the graft by means of the dressing The field is left undisturbed for from 7 to 10 days and the mold is worn for about 10 weeks This method provides a supporting graft which can be shaped to suit any contour Microscopic study of healed material has shown that the particles are firmly organized by fibrous tissue with adequate vascular ingrowth Another point in favor of this technic is that a small piece of cartilage when minced will fill a much larger space than when whole (Peer 1944)

Minced cancellous bone has also been used with particular success as graft material for the nose (Mowlem 1944 Fomon 1945 Barsky 1945) The question of establishing an adequate blood supply is of great importance in any graft operation The vascular tissues must be formed early and in sufficient amount to ensure the nutrition necessary for the life of the transplant It is claimed that cancellous bone is comparatively better suited to this adaptation than other material and has proved to be especially so when fragmented. The structure of this type of bone tissue favors rapid ingrowth of blood vessels and consequently enhances its survival The iliac crest furnishes the most abundant supply of this type of bone tissue

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tions of such lines were not the same in all parts of the body surface and that they could be narrowed or widened by stretching the skin either parallel or at right angles to the wound.

When Malgaigne (1859) studied the phenomenon he failed to find a general law governing it in all parts of the body based on fiber direction He then experimented with the degree of retractility of incisions of different lengths

Because these limited observations seemed of great importance to Langer (1861) he undertook a more extended investigation. His theory was that in closely situated areas there was a definite relationship and that it would be possible to group lines and fields that were similar These lines should be an expression of skin fiber supply and represent the texture, the swelling quotient the elasticity and other skin qualities including differentiation of longitudinal and cross sections

In a large series of experiments made on cadavers of all ages and various physical conditions, this theory was confirmed

Langer's findings indicate that fiber direction in some body areas in children differ from that in adults also that in some areas there is a feltwork of fibers which gives a 3 sided and, on rare occasions a 4-sided wound

Some of his general conclusions were (1) If the existing tension of the skin is destroyed by incision its elasticity tends to restore its original equilibrium (2) Retraction differs widely according to the degree and the direction of the incision (3) On the same body and with the same length and depth of incision there will be a difference in the degree of retraction depending upon the incision's direction (4) A similar variation depends upon whether the skin is loosely or firmly adherent to the underlying tissue (5) The contractility of the skin is not based on the physical characteristics of its tissue elements but rather only on the arrangement of its fibers These fibers not only return to their original length but the network formed by them assumes its original arrangement. (6) The tissues of the face are in general under less tension than those of the body elsewhere

Thiersch (1874) studied the histologic processes which took place in a healing skin graft. He found that vascular ingrowth had taken place at the end of eighteen hours to such a degree that the graft could be injected through the vessels of the granulating sur

face. He refers to the ancient custom in India of beating the donor area until it was "thoroughly swollen" (with a "wooden shoe"). This practice may have reached the same result as the recent use of fibrin, since the tissue swelling would signify that its spaces were filled with blood elements.

Many dimensions and thicknesses of skin have been tried out and studied from the standpoint of age, sex and race, with the resulting indication that thickness is of considerable importance. But the greatest significance concerns the source of the graft material.

A study of the reactions of homografts and heterografts (Padgett, 1931) showed that in two sets of identical twins grafts between twin mates took and were in satisfactory condition a year later. Other interfamilial grafts (not twins) took well and remained in good condition for three weeks, but at the end of five weeks had entirely disappeared. Grafts were exchanged (Wolff in Padgett) between a mother and daughter and were controlled in both by autografts at the same time. The homotransplants at the end of two weeks had taken better than the control autografts, but by the end of the fourth week the homografts had disappeared. The experiment was repeated with other parent-child tests and with like results.

The factor of blood type has also been studied. It appeared that the outlook for an immediate take of grafts was better between those with nonagglutinating bloods, but that in time the grafts still degenerated.

The "individuality differential" (Loeb, 1930) or the chemical characteristics which all the tissues of a single individual share has been emphasized as a factor in the taking of grafts. While evidence is not considered conclusive, it appears to indicate that "primary substances" which act as toxins, and so affect the cells of the host as to cause a reaction, are given off by the graft.

Skin grafting between parabiotic animals, both in good health, does not give good results, and the viability of autografts in these animals is decreased.

Grafts between animals and man take less successfully than those between man and man.

Shrinkage of a graft is a particularly important factor in skin transplantation. Careful study (Davis & Kitlowski, 1931) has shown that the fibrous tissue determines the contracting of grafted

skin By means of microscopic study it has been found that the greater part of the fibrous bundles lie parallel to the lines of skin tension (Langer s lines) and that if these fibrous bundles are incised at right angles there will be skin retraction From a comparative study of skin grafts of decreasing thickness taken from the thigh the abdominal wall and the arm the average shrinkage appears to be

1 Whole thickness 43 60 per cent
2 Half thickness 24 84 per cent
3 Ollier Thiersch (thick) 11 81 per cent
4 Ollier Thiersch (thin) 1.24 per cent

Miscroscopic study of these types reveals that the degree of shrink age parallels the amount of fibrous tissue in each and that there is none in the true Ollier Thiersch graft From this the conclusion is drawn that the small degree of shrinkage here is caused by the action of the tissue cells themselves

Another factor enters into the question of skin-graft shrinkage If the surface to which the graft is applied is movable and deeply denuded there may be as much as 60 per cent contraction but if the underlying surface is firm and relatively immobile the shrink age is much less

Types of Skin Grafts. The conclusion has been reached that for simple coverage with no considerable loss of tissue the thin surface graft is preferable But with loss of tissue large skin flaps are required These are pedicled grafts but whether they shall be delayed or delayed with tube pedicle or again whether they shall be tube pedicle migratory grafts, is a question on which surgeons of equal experience and ability are divided

The advantages of skin flaps (Padgett 1942) are (1) They have *high resistance to infection* (2) *they are suited to filling in large* defects (3) contraction is relatively little (4) they are not easily injured (5) they are soft and pliable (6) their color is more nearly normal Their disadvantage is chiefly the length of time required for pedicled flaps and the emotional and economic significance for the patient.

For surface coverage grafts there are (1) Thiersch graft 0 008 inch (0 2 mm.) to 0 10 inch (0 25 mm) thick (2) split or superficial intermediate graft about 0 012 inch (0 3 mm) to 0 016 inch (0 4 mm) (3) three fourths thickness graft 0 26 inch (0 5 mm)

to 0.024 inch (0.6 mm.), (4) full thickness in adult, 0.032 inch (0.8 mm.) to 0.040 inch (1.0 mm.)

The full-thickness graft has the same appearance as normal skin surface, but it is less apt to take on an aseptic denuded surface than a thin graft. Of those which do take, as large a proportion as two thirds usually show superficial blisters followed by peeling, and often final pigmentation. On a granulating surface it almost never takes.

The thinner grafts can be obtained in larger dimensions and more easily, leaving little injury to the donor area, which can be used again in from 3 to 4 weeks if needed. These thin grafts are almost certain to take, but as a rule the cosmetic appearance is proportionally less the thinner the graft used. Their added value is that they blister less than the thick grafts and seldom become necrotic.

Taking a Graft. For a thin surface graft, the material is best taken from the inner thigh or the upper part of the outer thigh in adults, because these areas are relatively hairless. In babies, graft material is taken from the abdominal surface.

The recent precision methods are generally in use at the present time. The skin can be held tense and flat by traction pressure on either side of the knife, which is a strip of razor steel about 18 x 2 cm., kept very sharp and set in a stiff back or holder. A straight-backed razor with heel and toe sharpened can also be used, though it is not so efficient. Cutting can be hastened by the use of suction retraction (Blair & Brown).

A somewhat more accurate way of cutting material for skin graft is by means of the dermatome (Padgett, 1939). This instrument consists of a movable drum which is glued to the skin and an attached knife which can be fixed at an exact measured distance from the drum and so can cut any required thickness, which is not possible by using free plastic blades. The difficulty in keeping the knife sufficiently sharp has led to the invention of a new knife carrier (Shumacker, 1944) in which safety-razor blades are held side by side, care being taken that they are all the same side up, as they are beveled on one side. This attachment can be sterilized easily, furnishes a fresh cutting edge by changing the blades, and has been found to be altogether reliable.

A dermatome furnished with safety razor blades with the same ability to cut very thin skin grafts uniformly and at any desired depth had already been devised (Poth 1939)

Another technical method for removing skin grafts by what is called a dermasector has been devised It is said to be simple and convenient and hastens the healing of split skin grafts. It makes use of a strip of flexible transparent cloth adhesive which adheres to the skin surface and an adjustable knife cuts the tissue in a manner similar to that of the dermatome (Berkow 1945)

Grafting When the skin graft is finally ready for use it is spread on a fitted stent mold and placed on the area to be grafted Interrupted sutures are passed through the skin margin and the edge of the graft on both sides of the stent and tied over it No further dressing is needed As a rule the stent may be removed after from 6 to 7 days except in congenital lues (McIndoe) Where the nose has been relined the mold should be kept in place for from 3 to 4 months being removed for only a few hours at a time until there is no more danger of contraction

REMOVAL OF RIB CARTILAGE

There is general agreement that rib cartilage is one of the most successful materials for grafts in reconstruction of the framework of the nose

Since the best results are secured with autografts the patient's own cartilage is preferred The material is taken from the costal border of the seventh the eighth and the ninth ribs always on the right side to avoid any possible complications involving the heart. Special care must be taken here that the pleura shall not be injured The mammary artery also must be avoided

Anesthesia Either a general or a local anesthetic can be used *This can be decided in large part by the patient, if an adult* A child should preferably be given a general anesthetic

Local Anesthesia With a long needle using the customary procaine adrenalin mixture (1 1000) in the syringe injection is done subcutaneously at several points to infiltrate the field. The infiltration should be of sufficient extent to ensure complete loss of sensation in the proposed area of operation From about 50 to 60 cc are usually required for blocking the intercostal nerves

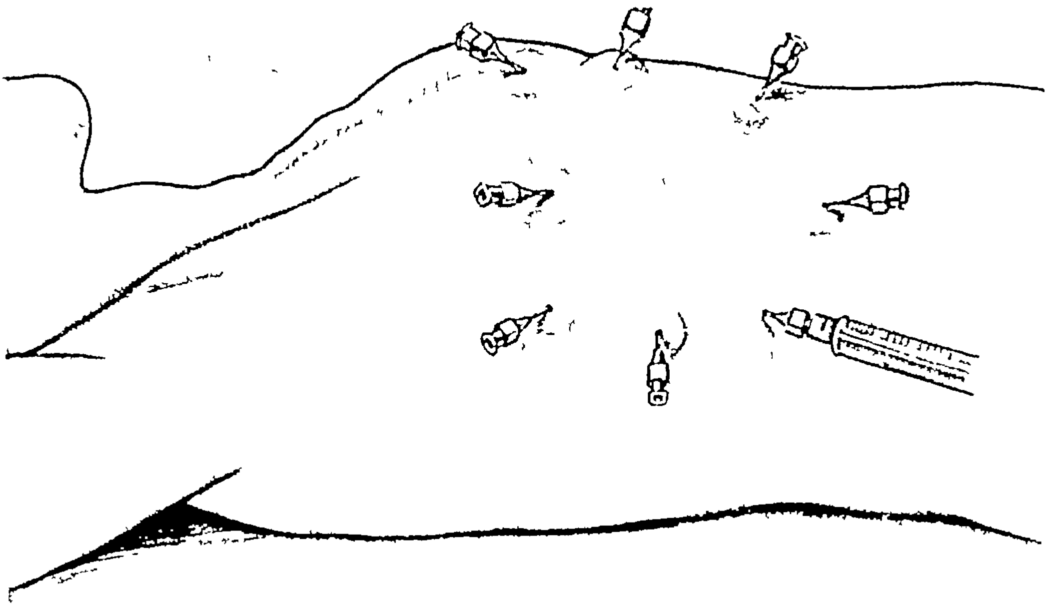


FIG 43 Area for the removal of the graft blocked off by injection of 1 per cent novocaine

Incision. A longitudinal incision from about 16 to 18 cm in length is made, following a line which represents the midline of the area to be removed and extending down to the perichondrium The walls of the incision are separated and undermined to expose the costal arch The perichondrium is then elevated to expose the surface of the hyaline cartilage All bleeding points are tied off

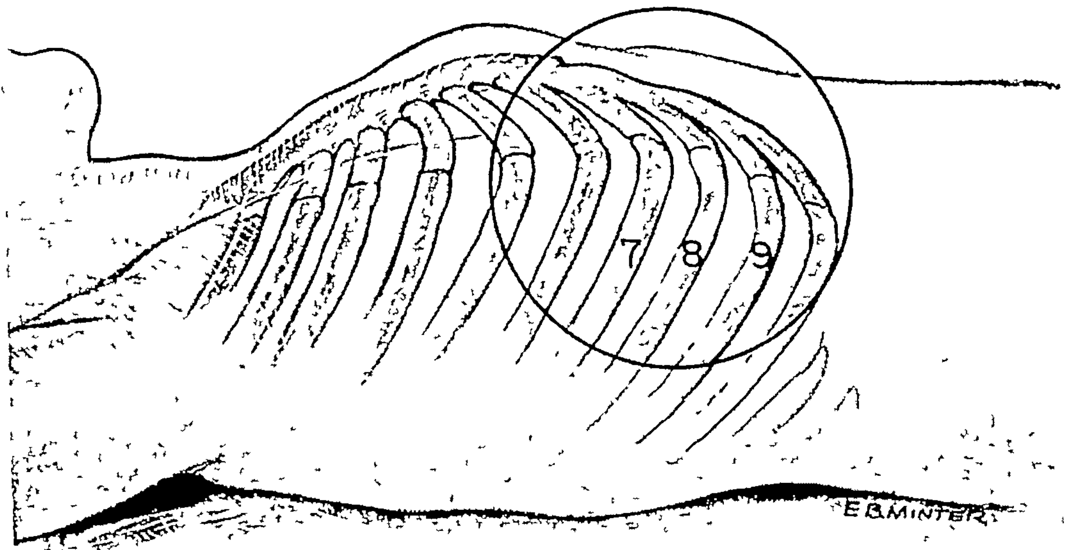


FIG 44 Area of thoracic wall at the junction of the 7th, 8th and 9th ribs where rib transplant is removed



FIG. 45 The 12 to 16 cm longitudinal incision in the previously blocked off area over the 7th 8th and 9th ribs on the right side.

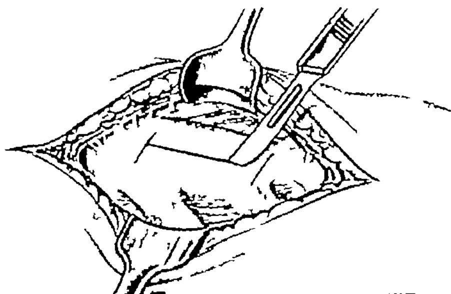


FIG 46 Retracted tissues show the longitudinal incision being made on the costal arch through the perichondrium for the removal of the graft.

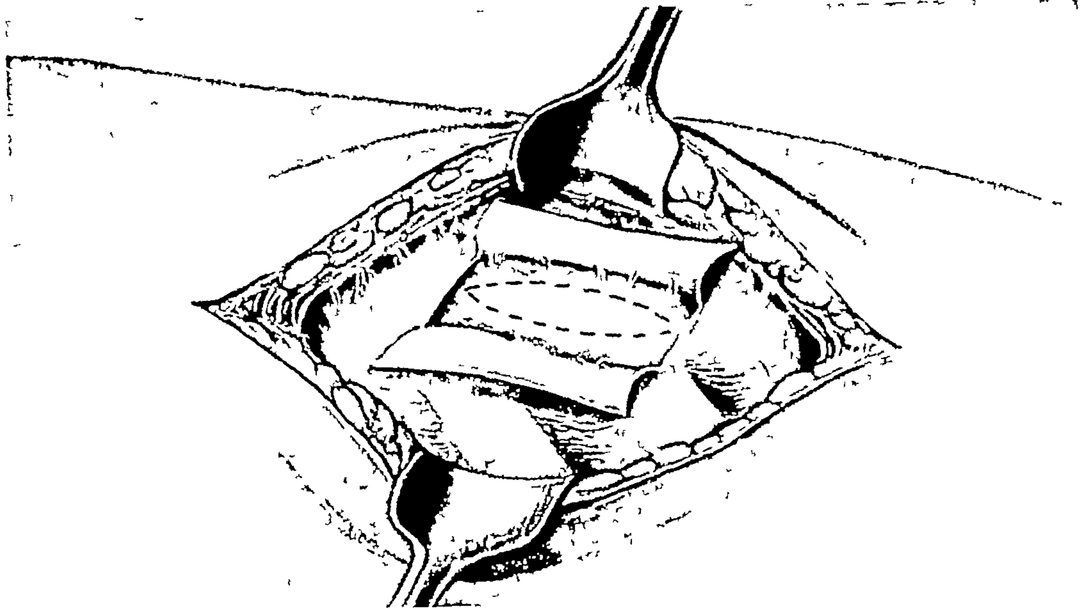


Fig 47 Site for removal of cartilage after perichondrium has been lifted and retracted

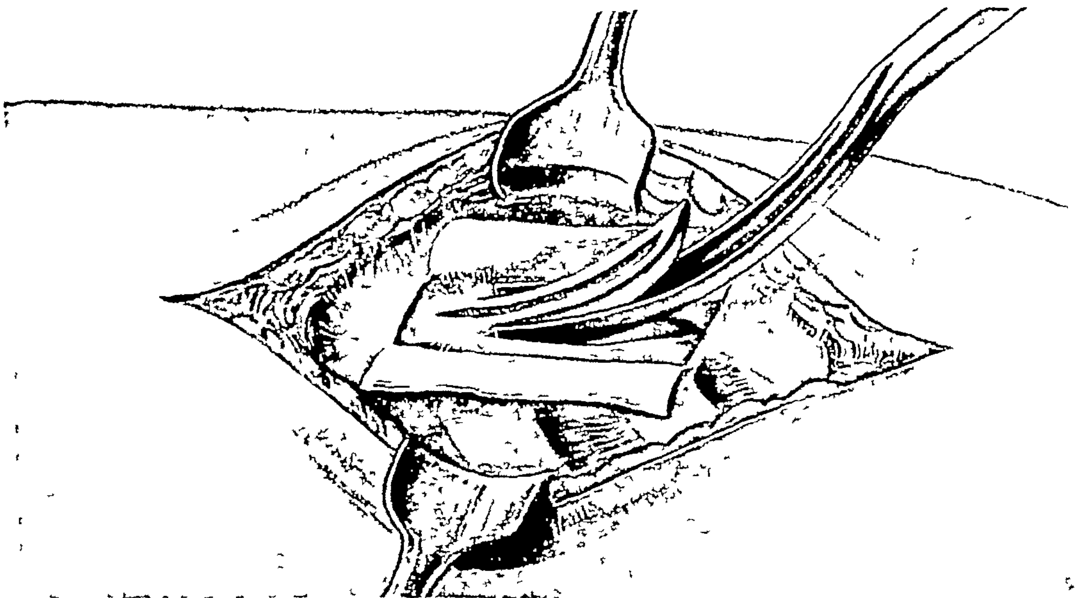


Fig 48 Wood-carving type of hollow chisel gives the graft a curved outline suitable for the nasal dorsum (Note groove in cartilage graft for fixation on dorsum of the nose)

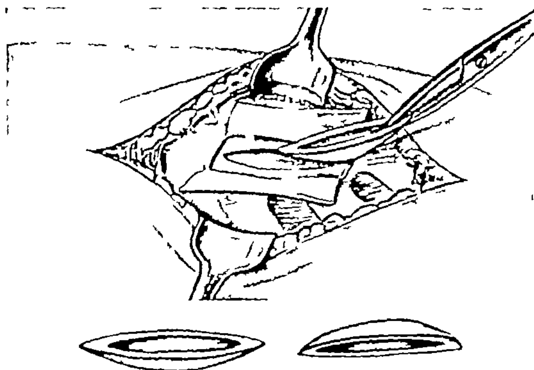


FIG 49 *(Top)* Curved cartilage graft removed from under the peri chondrium with hemostat. *(Bottom)* Upper and lower faces of the cartilage graft shown above and ready for transplant (Note groove made for fixation)

Cartilage Using a gouge (*see* Instruments) narrow pieces of cartilage are chiseled out Either full or only partial thickness of the cartilage may be removed These are usually from about 4 to 5 cm in length 1 cm in width and 0 5 cm in thickness if for a single graft But it is usually advantageous to remove a larger amount of the material than is necessary for the immediate opera tion in case more should be needed later Any surplus can be buried under the loose skin beneath the patient s breast or in the groin for later use as needed

After the desired amount of cartilage has been removed the perichondrium is drawn together and may be sutured or not according to the judgment of the operator The subcutaneous tissues are sutured together from within outward including finally the skin. An adhesive dressing is applied This should be changed at the end of five days and discontinued as indicated by the condi tion of the wound.

The cartilage is available for modeling, as has already been described.

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11

A Typical Rhinoplasty

REMOVAL OF THE NASAL HUMP

Removal of the hump is done preferably by the intranasal route. This operation not only involves removal of an excess of tissue which causes a convex outline of the nose but includes secondary

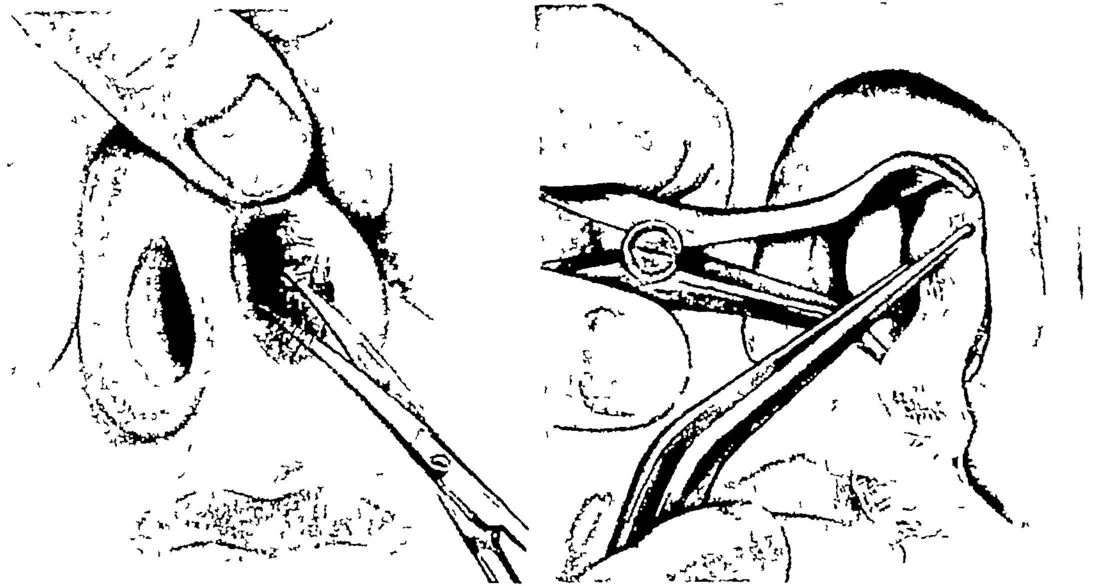


Fig. 50 *(Left)* Clipping the vibrissae. *(Right)* Packing the nasal fossae.

operative measures. A relative widening of the nasal bridge results from the primary operation. This must be reduced to harmonize with the new proportions of the nose. To secure a suitable outline of the new nasal profile, the septum also may require shortening and the shape of the upper and the lower lateral cartilages and the nasal tip (lobule) may require alterations. It is axiomatic that removal of a small hump presents greater difficulties than that of a large one.

In addition to the maintenance of strict asepsis, there are four other guiding points especially emphasized by Coates. (1) Good



Fig 51 *(Left)* Long nose with hump and curl and narrowing of upper lip when smiling
(Right) Same after removal of hump and lengthening lip

light, (2) careful dissection, (3) bloodless field, (4) good anesthesia

After careful routine cleansing of the face and of the field of operation, as already described in detail under preliminary measures, with the patient on the operating table and the head raised at an angle of 35 degrees, the head is draped by spreading two sterile towels beneath it, then wrapping the upper one closely about the hair and securing it with hemostatic forceps This is done in such a manner that the face is entirely free, thus leaving the nose in full view A thin layer of gauze wet in cold sterile water is placed over the mouth to keep the lips moist This also helps to prevent thirst Squares of gauze may be placed over the eyes if this procedure adds to the comfort of the patient

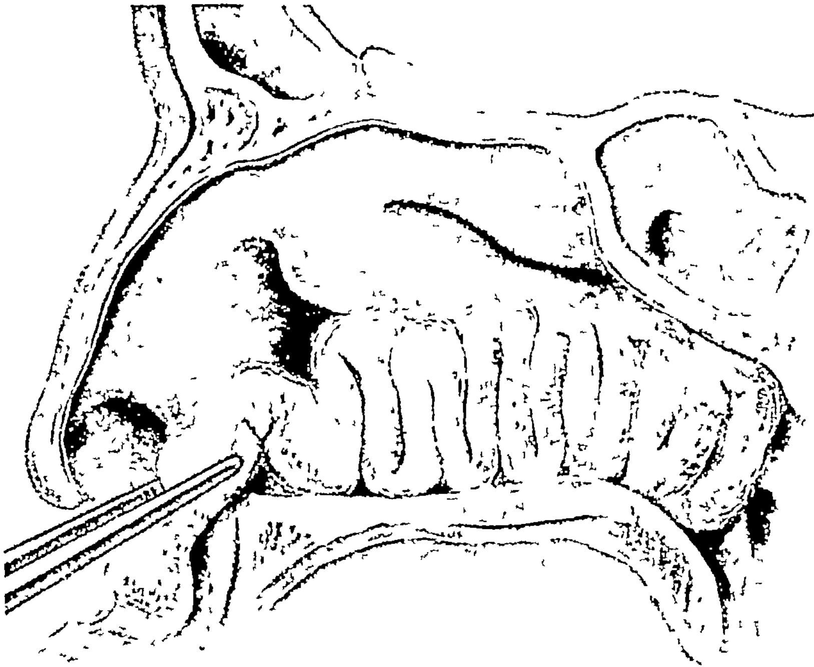


FIG 52 Packing the nasal fossae Interior view

ANESTHESIA

The Septum. For this purpose, the writer uses small pledgets of cotton or preferably a piece of sheet cottonoid cut in the shape of a Simpson splint and placed closely against the side of the septum This material is wet in equal parts of cocaine hydrochloride and 1 1000 epinephrine hydrochloride Three applications of three minutes each give good anesthesia to the septum. When this step



Fig 53 (*Left*) Long projecting nose with hump and slightly hanging tip (*Right*) Same profile after surgical correction

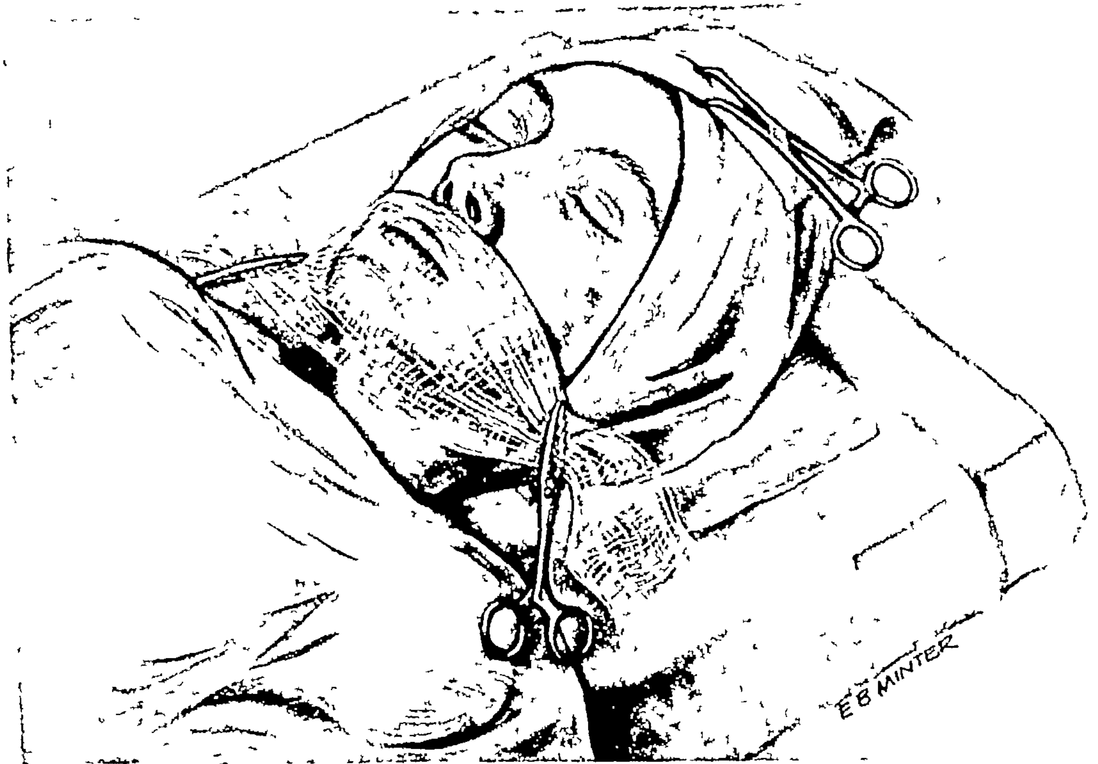


FIG 54 Preoperative preparation of patient proper position, head draped, gauze over mouth is moistened with sterile water for patient's comfort

is completed, the posterior parts of the nasal cavities are packed with strips of ½ inch gauze to exert hemostasis and prevent dripping into the postnasal space

The External Nose For this purpose the writer prefers infiltration anesthesia

1 To infiltrate the dorsum a 2-inch 24-gauge needle with syringe containing a 1 per cent solution of novocaine (procaine) hydrochloride with 5 drops to the ounce of 1 1000 epinephrine hydrochloride is inserted midway in the nasal fold and carried upward subcutaneously to the glabella under the control of the forefinger and the thumb of the free hand to prevent puncture of the overlying skin The solution is expressed gradually as the needle is withdrawn This injection serves to block the infratrochlear nerve and is repeated on the right side

2 The needle is introduced intranasally at the extreme outer margin of the naris and carried over the nasal bones to the nasofrontal suture, the solution again being expressed as the needle is



Fig 55 (*Left*) Profile elevation of 44 hump nose (*Right*) Same case Profile reduced to 33 hump removed

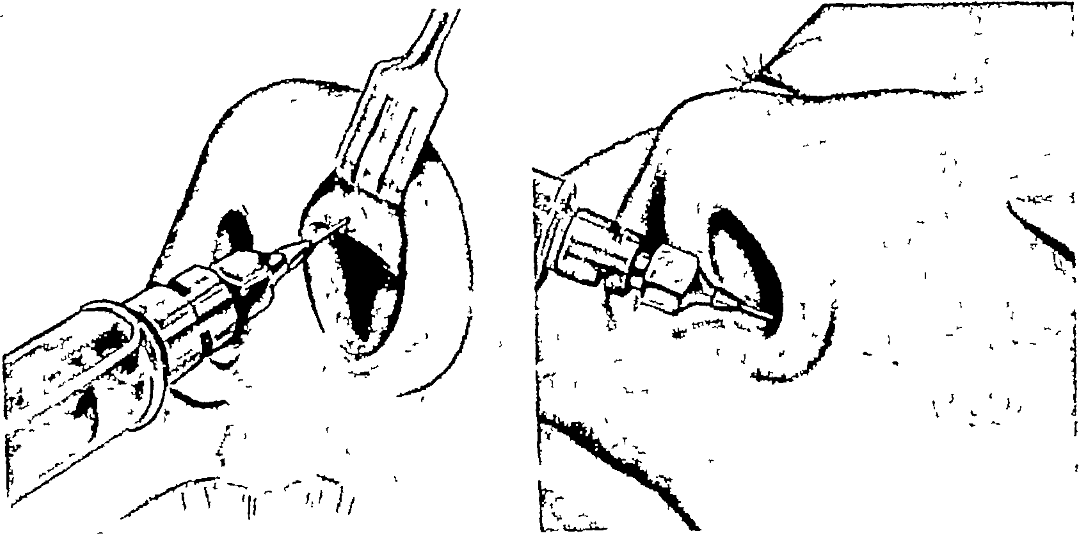


FIG 56 *(Left)* Injection of anesthetic (novocaine solution) into the aponeurosis between the upper and lower lateral cartilages *(Right)* Similar blocking of the infra-orbital nerve filaments

withdrawn This secures infra-orbital nerve block This is repeated on the opposite side

3 With the needle inserted at the same point the solution is expressed beneath the periosteum of the nasal bones This is repeated on the opposite side

4 With a 1-inch 24-gauge needle the base of the nose is anesthetized by injecting the solution subcutaneously about the external

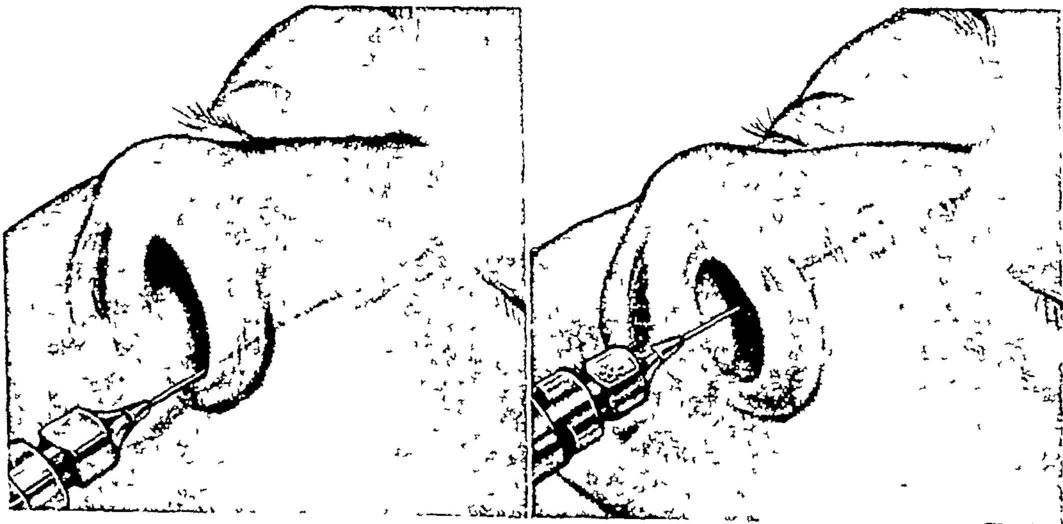


FIG 57 *(Left)* Injection (blocking) of infratrochlear nerve. *(Right)* Injection of the nasociliary nerve



FIG 58 (*Left*) Nose with slight hump (*Right*) After removal of hump and upward tilt of nasal tip

nares of each side at the tip, the middle and the base of the columella and at three equidistant points round the lower margin of each ala

INSTRUMENTS

For successful results, all rhinoplastic operations require suitable instruments, each of which is specially adapted to its particular use

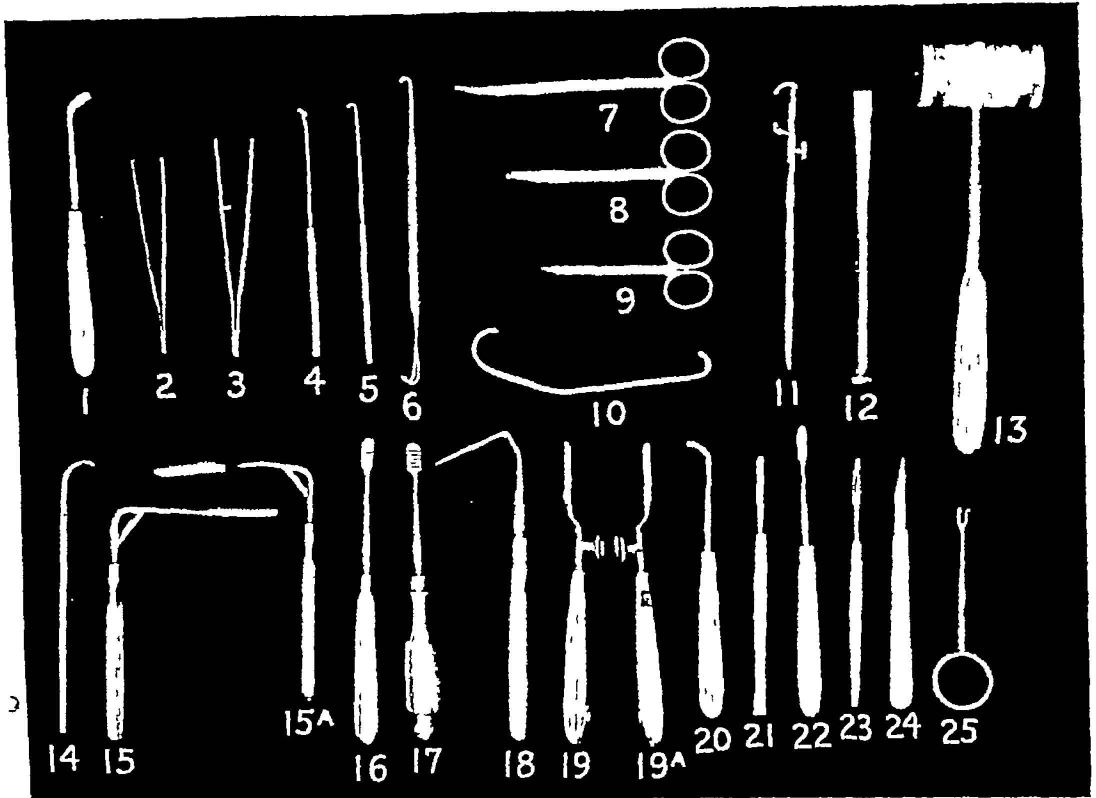


FIG 59 Instruments used in nasoplastic operation (1) Maltz double knife for septum (2) Fixation forceps (3) Fine forceps with serrations (4) Joseph's two-pronged tenaculum (5) Dural hook (single) (6) Neivert's retractor for lower lateral cartilage (7) Curved scissors (8) Mayo scissors (9) Joseph's curved scissors (small) (10) Angular retractor (11) Seltzer's columella clamp (12) Chisel for nasal bridge (13) Mallet (vulcanized rubber head) (14) Grooved director (15) Joseph-Maltz saw (left) (15A) Joseph-Maltz saw (right) (16) Glabellar rasp (17) Lewis rasp (coarse) (18) Aufricht nasal speculum (19) Maltz nasal saw (right) (19 A) Maltz nasal saw (left) (20) Joseph's angular knife (21) Joseph's button-end knife (22) Joseph's periosteal elevator (23) Joseph's pointed double-edged knife (curved) (24) Bard-Parker blade No 11 with handle (25) Double-pronged ring retractor



FIG 60 *(Left)* Hump nose *(Right)* Same after corrective surgery

For the proposed operation the following instruments have been found necessary

- Nasal speculum
- Pronged retractors
- Knives Bard Parker No 11 double edged knife curved on the flat button-end and angulated knives
- Periosteal elevators
- Joseph s right and left bayonet saws
- Joseph s right and left-angled saws grooved director
- Small chisel and mallet
- Scissors straight, curved and double-edged
- Nasal rasps fine and coarse
- Tissue forceps
- Walsham s forceps
- Mosquito hemostatic forceps
- Needles, needle holder suture material
- Dural hooks
- Record syringe with needles of various sizes
- Stent modeling compound

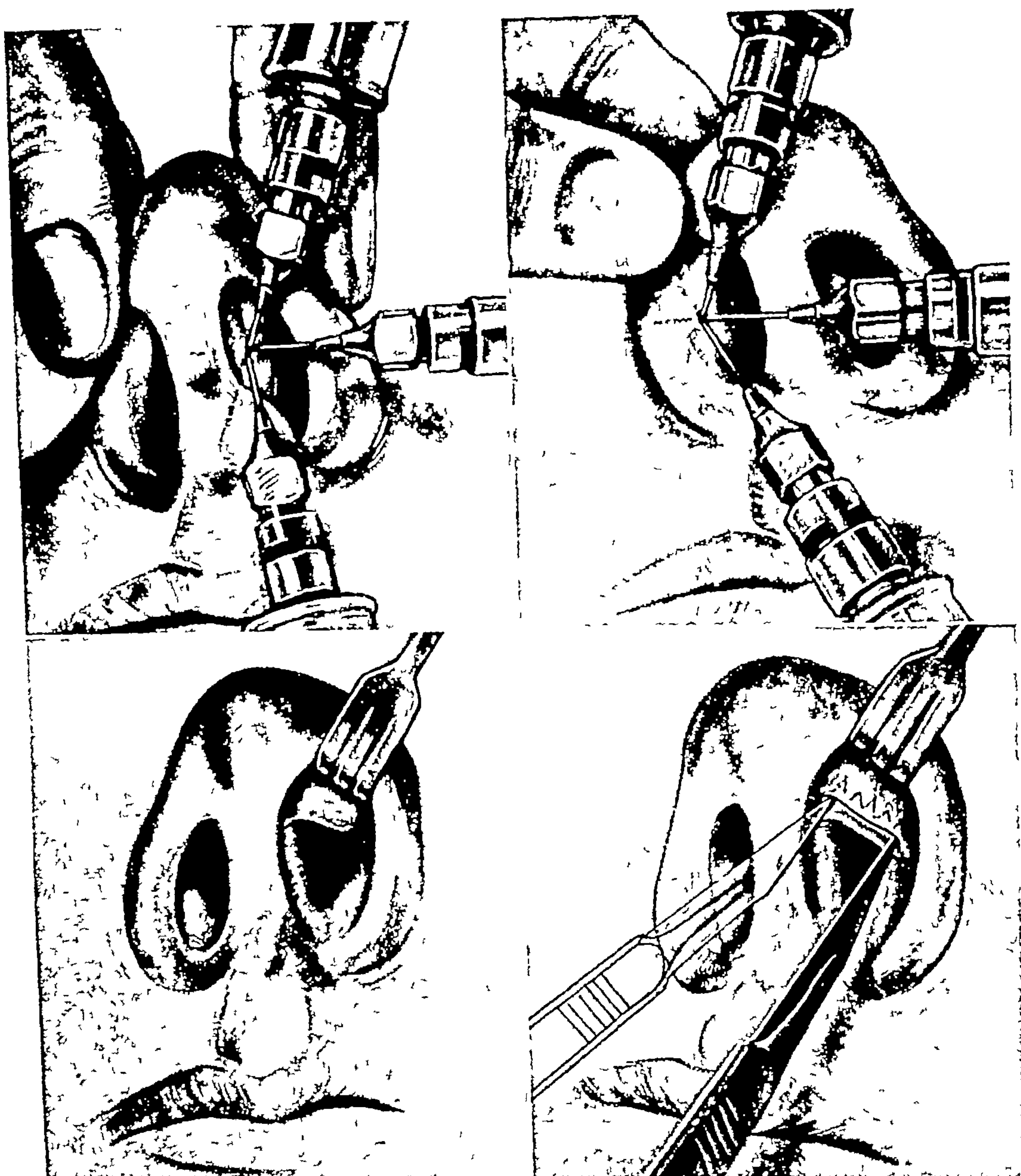


FIG 61 *(Top, left)* Cross-fire injection of novocaine-adrenalin solution to anesthetize the columella, including the medial crura *(Top, right)* Same method for anesthetizing the alae nasi and lateral crura *(Bottom, left)* The shelf between the upper and lower lateral cartilages exposed by elevating the rim of the nostril with rake retractor *(Bottom, right)* Incision with Bard-Parker No 11 directed from left to right and parallel to shelf

OPERATION TO REMOVE HUMP

Each step is always carried out first on the left side of the nose and repeated on the right side



FIG 60 *(Left)* Hump nose *(Right)* Same after corrective surgery

For the proposed operation the following instruments have been found necessary

- Nasal speculum
- Pronged retractors
- Knives Bard Parker No 11 double edged knife curved on the flat button-end and angulated knives
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- Joseph s right and left angled saws grooved director
- Small chisel and mallet
- Scissors, straight, curved and double-edged
- Nasal rasps fine and coarse
- Tissue forceps
- Walsham s forceps
- Mosquito hemostatic forceps
- Needles needle holder suture material
- Dural hooks
- Record syringe with needles of various sizes
- Stent modeling compound

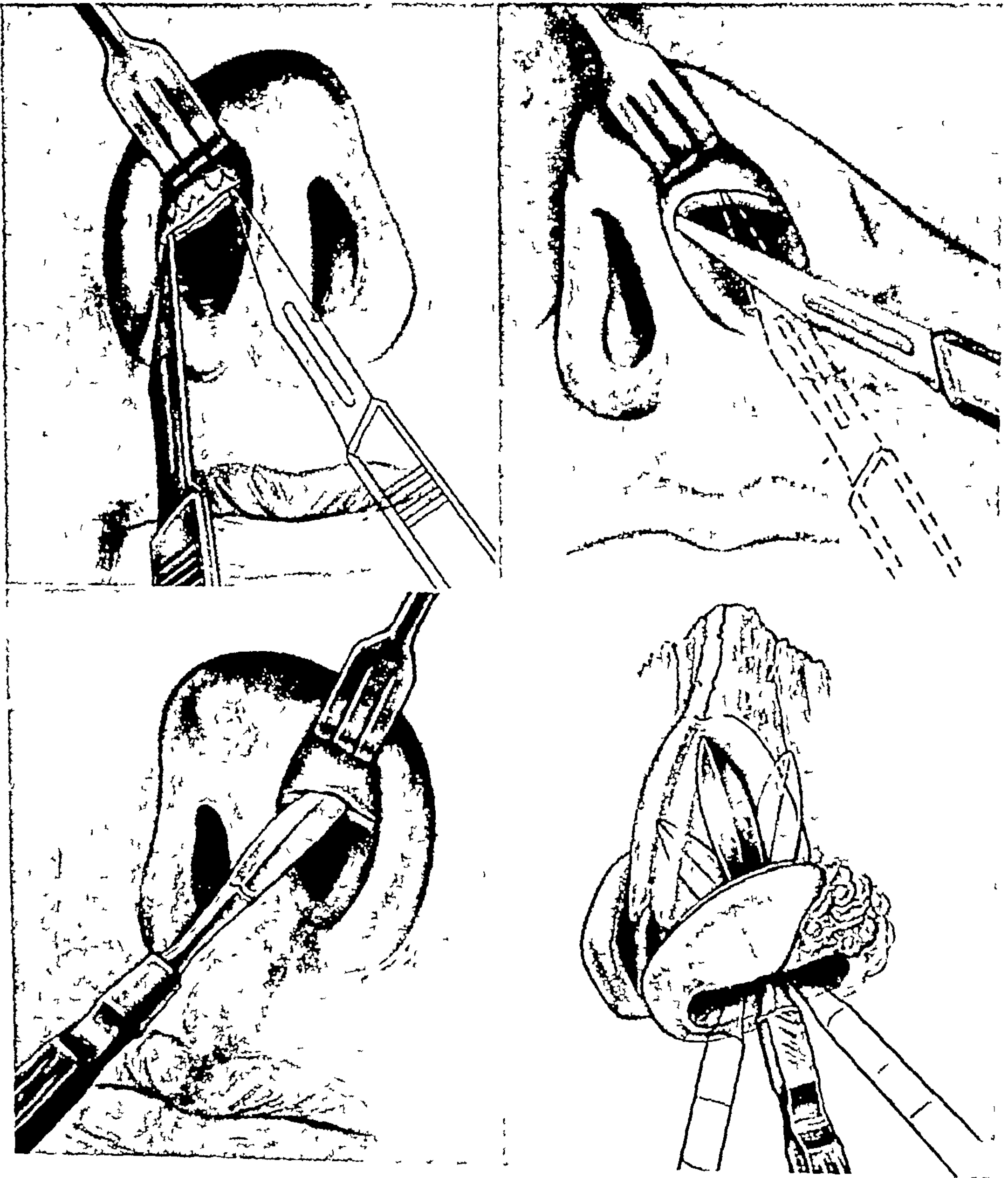


FIG 63 *(Top, right)* Primary incision with Bard-Parker blade No 11 cutting from right to left *(Top, left)* Incision on the opposite side with Bard-Parker knife *(Bottom, left)* Joseph curved double-edged knife inserted into the incision to undermine *(Bottom, right)* Joseph curved double-edged knife undermining over the nasal dorsum This should be done deep enough to avoid disturbing the vascular supply

By means of a rake retractor or simply the thumb and the forefinger of the free hand, the tip of the nose is raised. This causes a ridge or shelf to appear on the lateral wall of the nasal cavity at



Fig 62. (*Left*) Profile with hump nose. (*Right*) Same nose after esthetic correction.

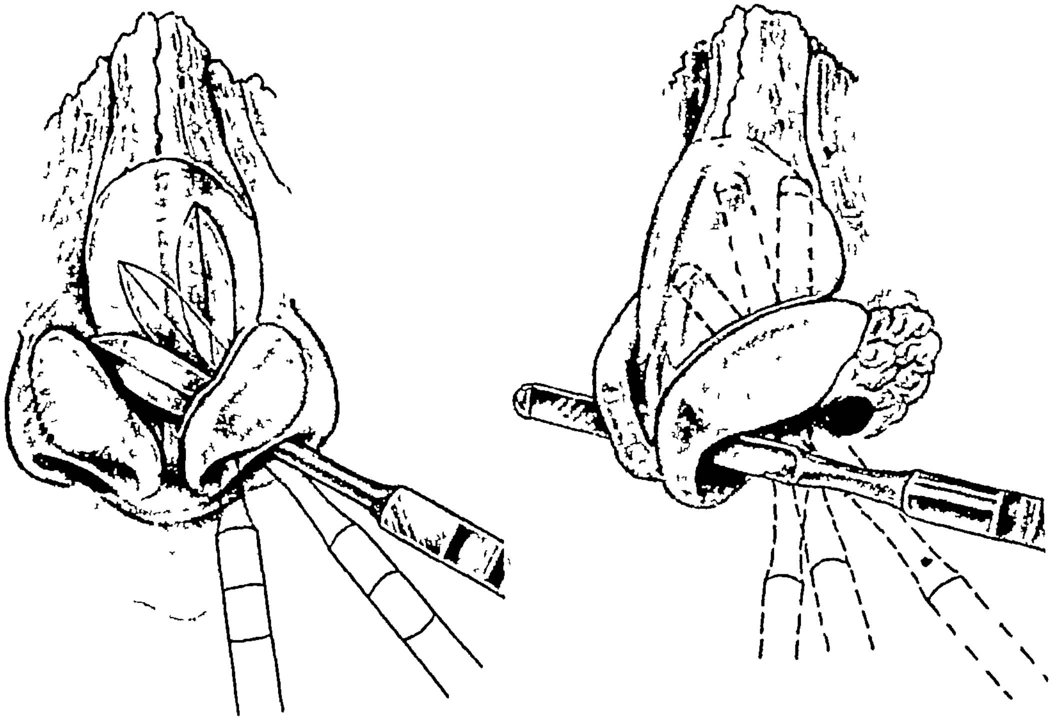


FIG 65 *(Left)* Undermining the nasal dorsum with Joseph knife This must always be done deeply to avoid disturbing the vascular supply *(Right)* Straight button-end knife cutting through the strands of fibrous tissue on the dorsum as it is brought down over the septum

the junction of the upper and the lower cartilages, which represents the lower border of the former This ridge varies in length in different noses With a Bard-Parker No 11 knife, the incision is made from the outer toward the median or septal side through the upper part of the surface mucous membrane This section passes between the upper and the lower lateral cartilages and so cuts through the fibrous connection between them The incision must be made with a sawing movement, as this tissue is somewhat resistant Particular care must be taken not to cut through the overlying skin, which should be held lightly with the fingers of the free hand When the knife has been withdrawn, a small plug of gauze is inserted in the nostril to control bleeding

After this operation has been repeated on the right side, the cotton plug on the left is removed and a double-edged Joseph knife is introduced into the primary incision and carried upward with a side-to-side movement over the upper lateral cartilage, separating it from the overlying skin and so undermining over the dorsum



Fig 61 (*Left*) Long nose with prominent hump and hanging tip (*Right*) After removal of hump shortening nose and elevation of nasal tip

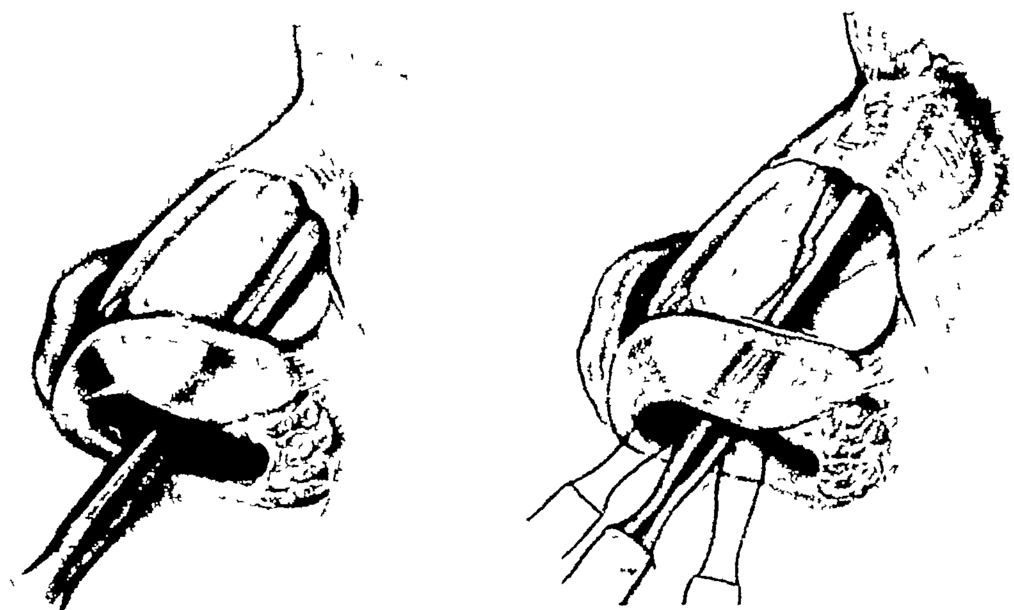


FIG 67 (*Left*) The elevator separates the periosteum from the nasal bones (*Right*) The side-to-side motion of the elevator in undermining the periosteum

osteum will have been undermined over the entire bony dorsum of the nose

A button-end knife is next inserted through the left incision and carried up over the upper lateral cartilage and beneath the periosteum of the nasal bone to the nasion, from where it is brought downward over the dorsum to the upper end of the septal cartilage until it appears in the incision of the right side (transfixion) The course of the knife is then continued downward nearly to the tip of the septum Palpating with the left hand, the section is continued along the lower edge of the septum, down to the anterior nasal spine Any part of the membranous septum remaining uncut may be completed with straight, fine-pointed scissors

Frequently there is no bleeding after this incision but, if it is indicated, the nasal cavities are packed with Nu-Gauze (kephrine hydrochloride)

If the bony hump is large, the periosteum covering the bone is also removed, since osteogenesis may be stimulated by its presence in the wound and result in hyperplasia and consequent postoperative deformity

The actual removal of the bony hump is now begun by introducing a right bayonet saw into the left incision and carrying it up

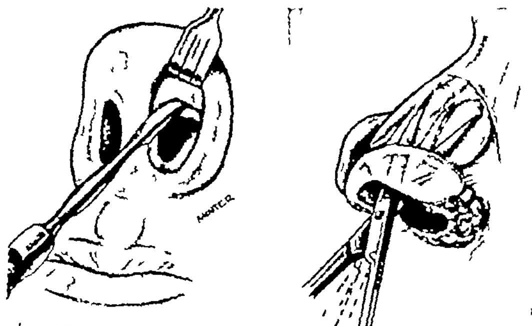


Fig 66 (Left) The periosteal elevator is introduced through the intercartilaginous incision. (Right) Double-edged scissors as used in undermining the skin and subcutaneous tissues

The knife is then withdrawn and cotton or gauze is put inside the nostril The same operation is done on the opposite side

For this step scissors may be used instead of a knife if this method is preferred by the operator

A McKenty sharp elevator is then inserted into the left incision and is pushed upward until with the instrument and the palpating fingers of the left hand the junction can be felt between the upper lateral cartilage and the periosteum of the nasal bone By tilting the patient's head slightly and exerting suitable pressure the peri*osteum on the lower border of the nasal bone is penetrated* and with careful lateral sweeps of the elevator a small subperiosteal pocket entrance is made ready for the following procedure This step must be carried out with careful precision only a small periosteal pocket is made and all is done without fraying the tissues.

Now a periosteal elevator is introduced and carried up to the pocket already prepared under the periosteum of the nasal bone, where the periosteum is now further elevated to the level of that part of the *nasal bone forming the hump which is to be removed* When this process has been repeated on the right side the peri

to the nasal bone, where it is placed flush against the bone at the proper level and in the exact position to remove the previously determined amount of tissue

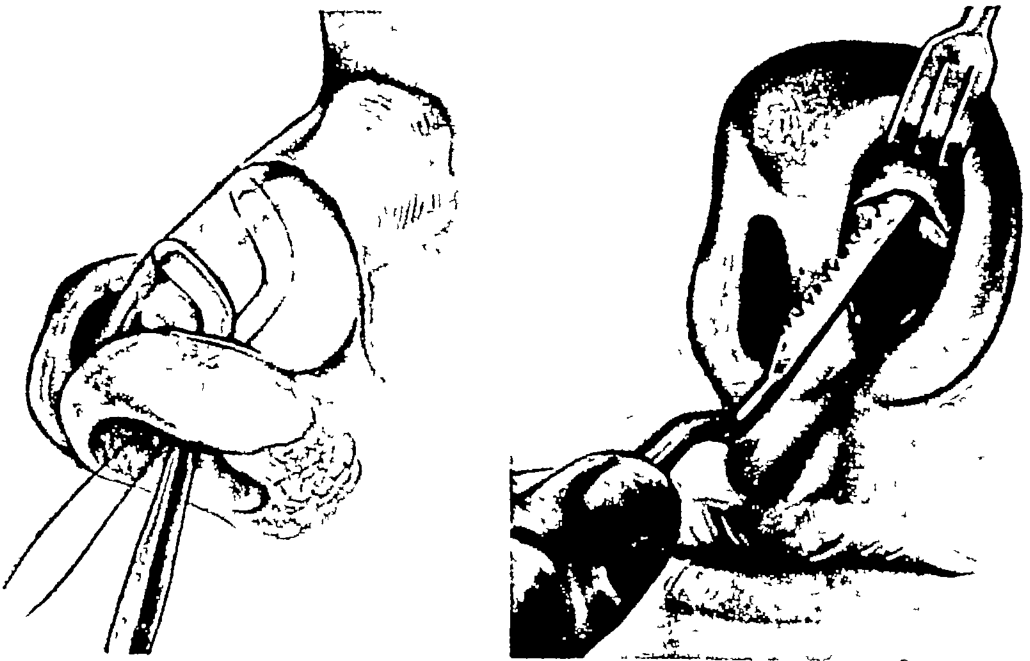


Fig 69 *(Left)* The angulated knife completes the undermining of the skin and separates any remaining adherent tissue *(Right)* Introduction of the saw into the intercartilaginous incision

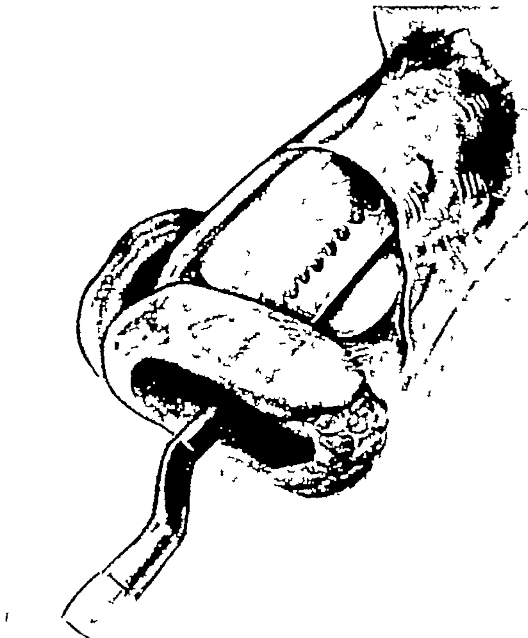


Fig 70 The saw as it lies under the periosteum ready to be directed upward into proper position



FIG 68 (*Left*) Hump nose with elongated septum before surgical correction (*Right*) Same profile after surgical removal of hump and shortening of septum



FIG 72 *(Top)* The saw in position to engage the hump to be removed *(Center, left)* The saw as it begins to cut through the hump *(Center, right)* Showing the saw completing the excision *(Bottom, left)* The angulated knife as used to cut through still-adherent tissue *(Bottom, right)* The button-end knife as used to ensure entire severance of the hump Some of the overlying periosteum is removed

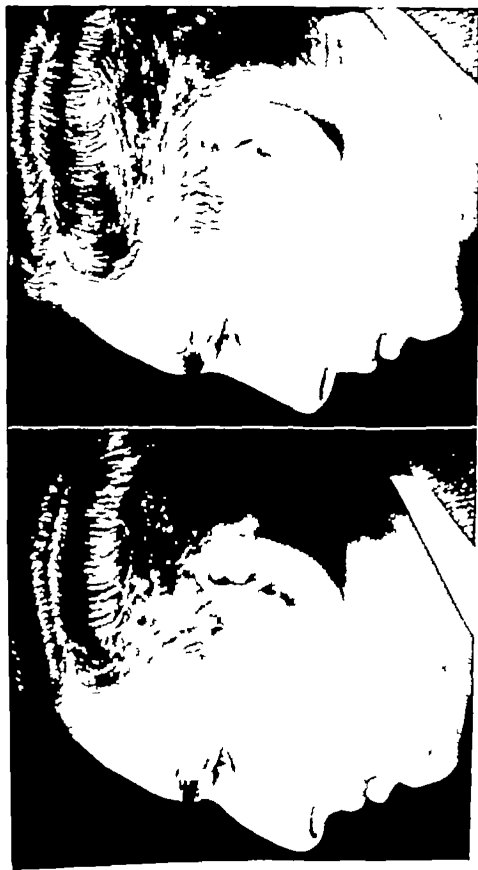


FIG 71 (*Left*) Long nose with hanging columella (*Right*) After removing hump and raising columella

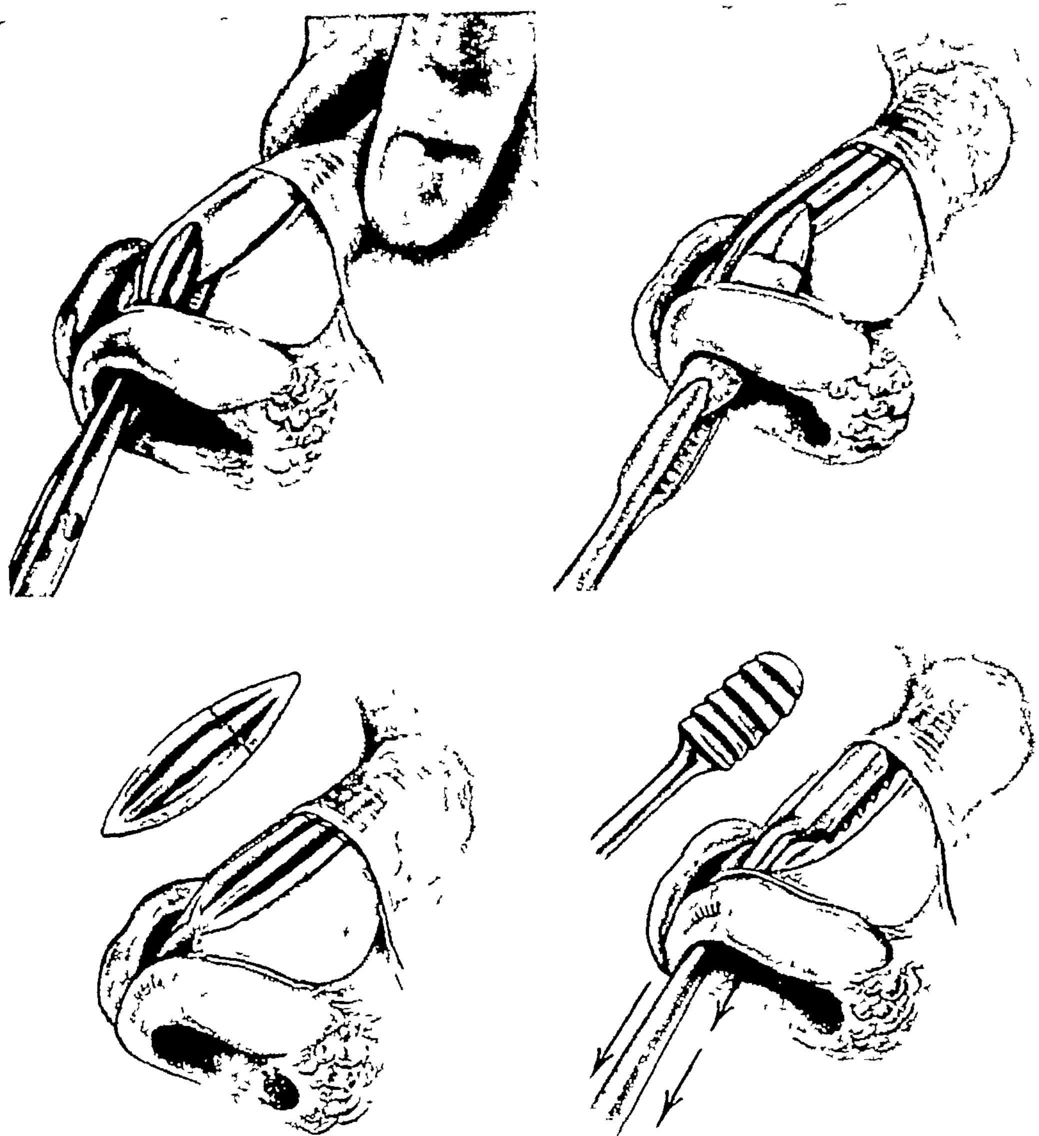


FIG 74 *(Top, left)* The severed hump is removed with a hemostat *(Top, right)* Withdrawing the hump *(Bottom, left)* The appearance of the nasal dorsum and the undersurface of the hump after its removal *(Bottom, right)* A coarse rasp is used to even the surfaces

When the saw is entered into the incision, it should be held with the back uppermost and in a position parallel to the nasal wall In that way, the smooth edge of the back of the saw will come in contact with and elevate the overlying soft parts, and so avoid injury to them When the position for sawing has been reached, the saw handle is rotated outward until the toothed cutting edge engages in the bony line to be incised



FIG 78 *(Top left)* Long prominent nose with hump wide columella and unequal nostrils right profile. *(Top right)* Same after surgical correction *(Center left)* Left profile before operation *(Center right)* Same after operation *(Bottom left)* Unequal nostrils *(Bottom right)* After correction

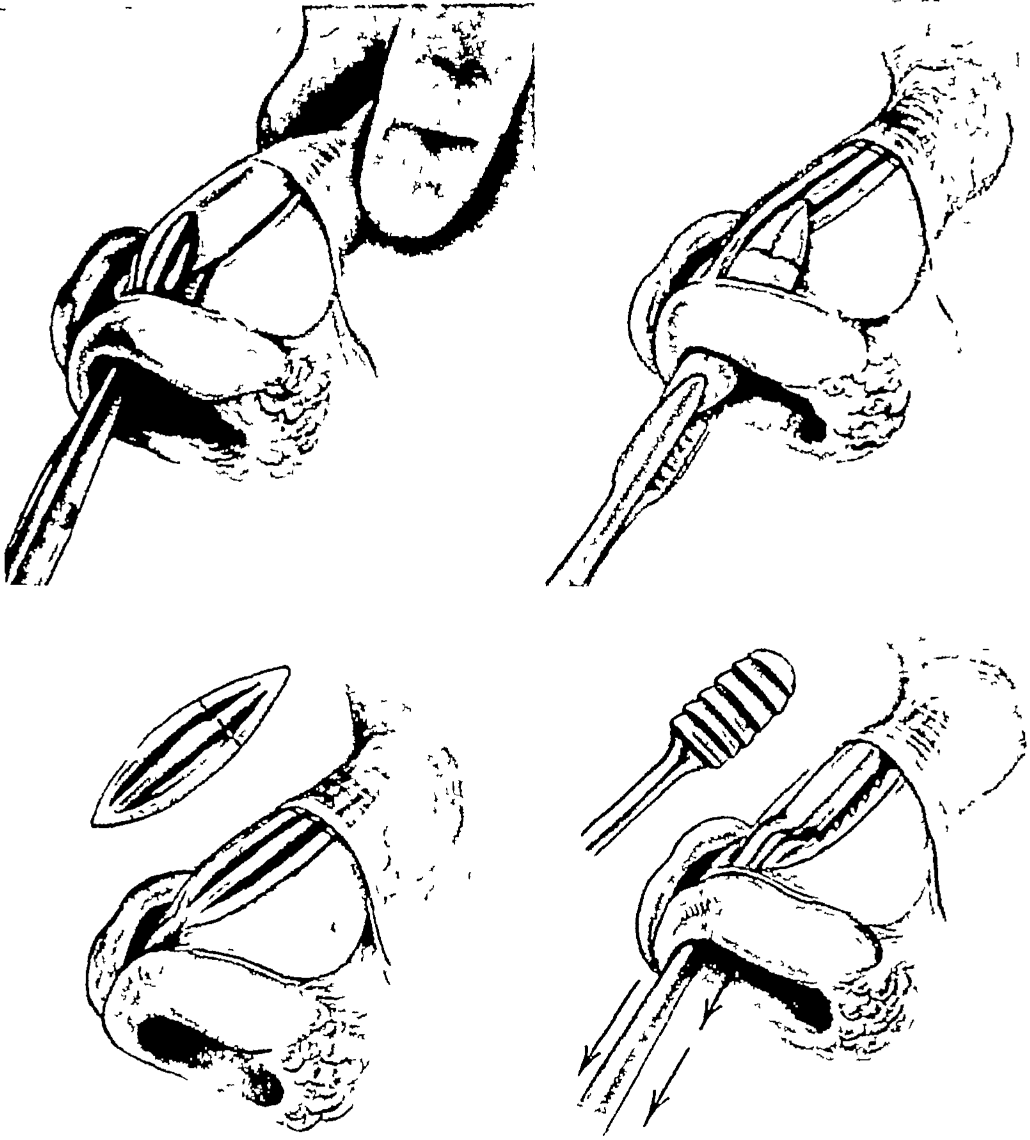


FIG 74 *(Top, left)* The severed hump is removed with a hemostat *(Top, right)* Withdrawing the hump *(Bottom, left)* The appearance of the nasal dorsum and the undersurface of the hump after its removal *(Bottom, right)* A coarse rasp is used to even the surfaces

When the saw is entered into the incision, it should be held with the back uppermost and in a position parallel to the nasal wall In that way, the smooth edge of the back of the saw will come in contact with and elevate the overlying soft parts, and so avoid injury to them When the position for sawing has been reached, the saw handle is rotated outward until the toothed cutting edge engages in the bony line to be incised



FIG. 73 *(Top left)* Long, prominent nose with hump wide columella and unequal nostrils right profile *(Top right)* Same after surgical correction *(Center left)* Left profile before operation *(Center right)* Same after operation *(Bottom left)* Unequal nostrils. *(Bottom right)* After correction

The saw is held in position and guided by the thumb and the index finger of the left hand. A slight groove is first made in the surface of the bone with the saw to mark the path of the proposed incision. With the saw held slightly tilted to one side, the operator can now cut with a sawing movement to the determined level until the perpendicular plate of the ethmoid has been cut through, when the left bayonet saw is used to repeat the operation on the right side The saw may become clogged with bone particles, when it should be removed and cleaned with a metal brush, then reintroduced to complete the operation

The bony hump is now completely severed and may be removed by means of angulated forceps, though hemostatic forceps are more efficient The fragment of bone must be withdrawn carefully without jerking or pulling, as this may injure the subcutaneous tissues or even tear the skin itself The area of the loosened hump is grasped by the left thumb and forefinger, the hemostatic forceps are inserted through one of the intranasal incisions, where the lower edge of the bone fragment is grasped and pushed upward somewhat to loosen it from its lower attachment, then it is drawn downward and completely removed

By palpation of the skin over the area from which the bone has been removed, sharp rough edges can be felt of the cut nasal bones on either side and of the perpendicular plate of the ethmoid along the midline This roughness is smoothed off by the use of either a fine or a coarse rasp, the choice depending on the condition to be corrected

If the cartilaginous septum then projects beyond the new profile line, or if it is uneven, it is shaved down to the required extent by the use of an angulated knife inserted through the incision, and the fragments are removed with forceps This measure is best carried out with the use of the Aufricht retractor, with which the skin over the nose can be elevated, and with good lighting the septum can be examined for projections or irregularities The septum can then be trimmed with scissors to suit the desired outline The overlying skin, which is now necessarily somewhat loose, easily adjusts itself to the new environment

These procedures leave the nose flat and the bridge relatively broad Safian emphasizes what others have recognized, that with the removal even of a small hump or any part of a larger one the

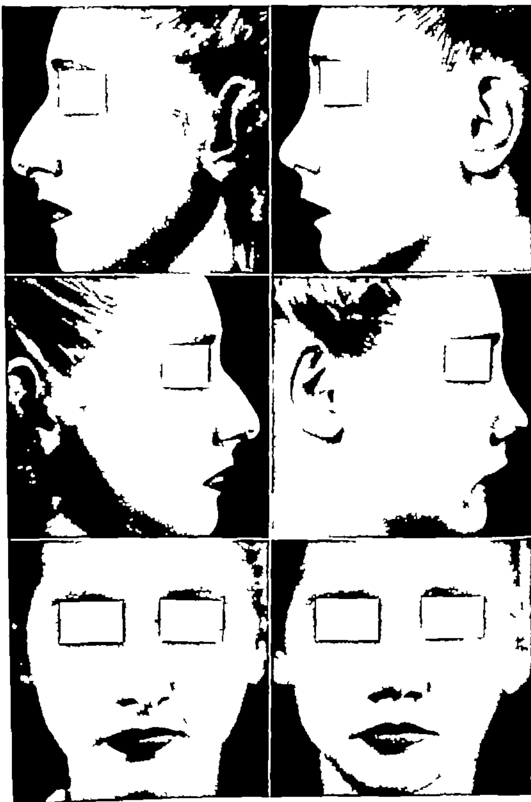


FIG. 75 *(Top left)* Hump nose with deflection of nose and septum *(Top right)* After correction. *(Center left)* Right profile before correction. *(Center right)* After correction. *(Bottom left)* Front face before correction. *(Bottom right)* After correction.



FIG 77 (*Left*) Long nose with hanging tip (*Right*) After raising tip by surgical shortening

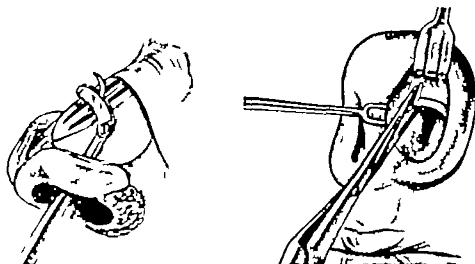


Fig 76 (*Left*) The Maltz knife is used to slice off the upper border of the septum to make the entire surface even (*Right*) Scissors are used to separate the upper lateral cartilage from the septum

bridge of the nose appears flat when seen in front view and must necessarily be corrected by a narrowing operation

NARROWING THE NASAL BRIDGE

The object of this operation involves fracturing or cutting through the frontal or ascending processes of each superior maxilla

With the lateral margin of the wing of the nose raised by the rake retractor the ridge which marks the lateral border of the crest of the maxillary process can easily be seen An incision is made through the skin within the vestibule at the junction of the nasal floor and the inner surface of the ala (Joseph) with a Bard Parker No 11 knife This incision is carried at once so deep that the knife point rests on the outer surface of the upper maxilla (Joseph) The opening is enlarged only enough to allow the passage of the necessary instruments A Joseph s periosteal elevator is inserted through this incision and beneath the periosteum which is then thoroughly elevated up to the inner canthus of the eye This prepares the fields, when repeated on the right side for separating the bone with the saw

When the periosteal elevator is removed a grooved director is introduced through the incision and a right angle saw is fitted into it With the patient s head somewhat tilted to one side to bring the nasal field uppermost a line is determined along which the saw shall

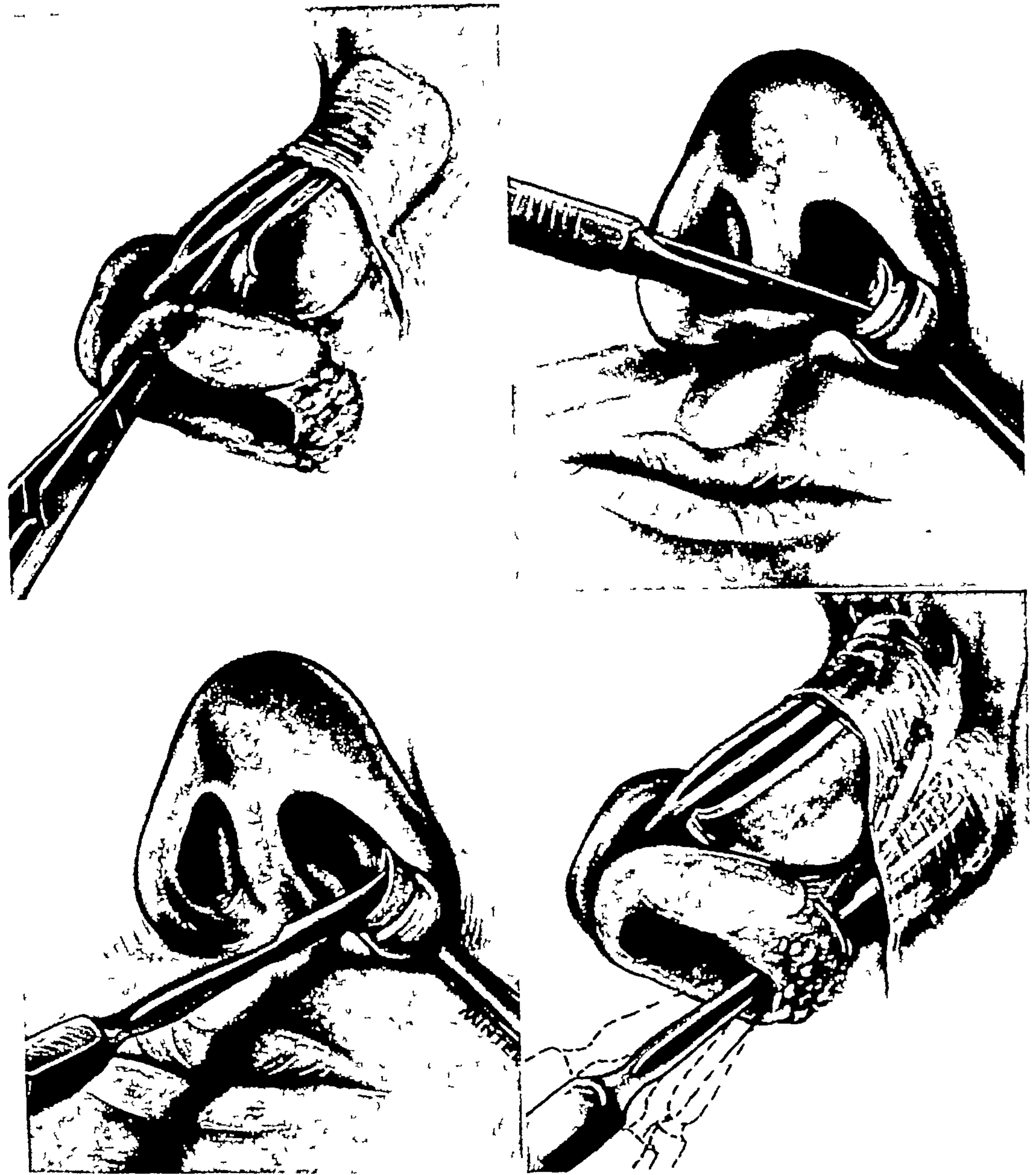


FIG 79 *(Top, left)* The upper lateral cartilage is cut away from the septum with scissors *(Top, right)* Incision is made with Bard-Parker No 11 knife into the mucocutaneous junction within the vestibule *(Bottom, left)* A periosteal elevator is inserted into the incision to separate the periosteum over the frontal process of the maxilla *(Bottom, right)* Shows the side-to-side movement of the periosteal elevator

be placed Frequently there is a well-defined naso-facial groove into which the saw slips easily Holding the saw firmly and with sufficient pressure, to-and-fro movements are made until it can be told



FIG 78 *(Left)* Elevation of profile line with long nose and protruding septum *(Right)* Same two years later after reducing the profile elevation shortening the septum and elevating the tip

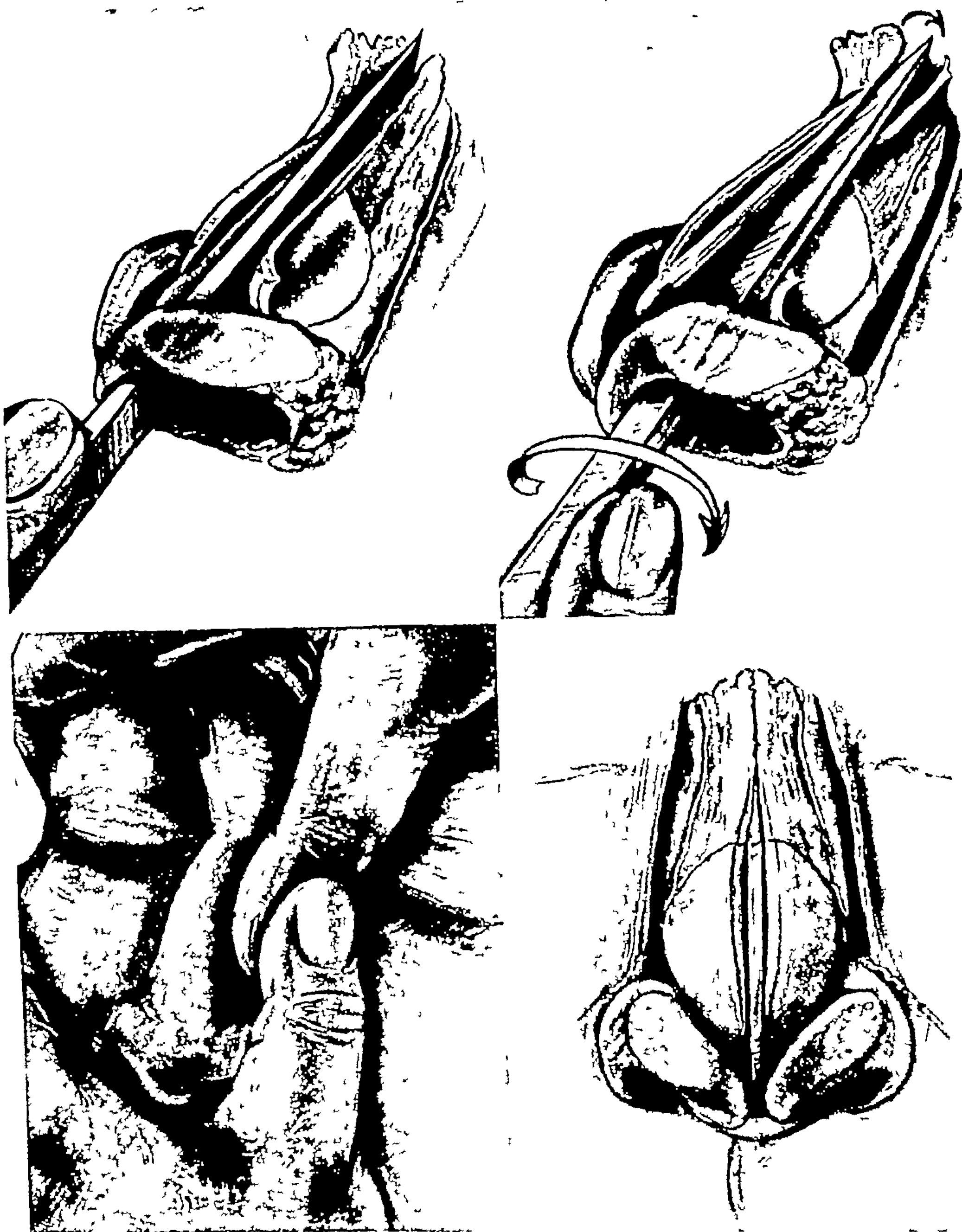


FIG 81 *(Top, left)* The chisel is inserted between the nasal bone and the perpendicular plate of the ethmoid, then turned outward *(Top, right)* Knife turned outward, as indicated by the arrow *(Bottom, left)* The bones can now be pressed into the midline without difficulty *(Bottom, right)* The bones are here shown in apposition

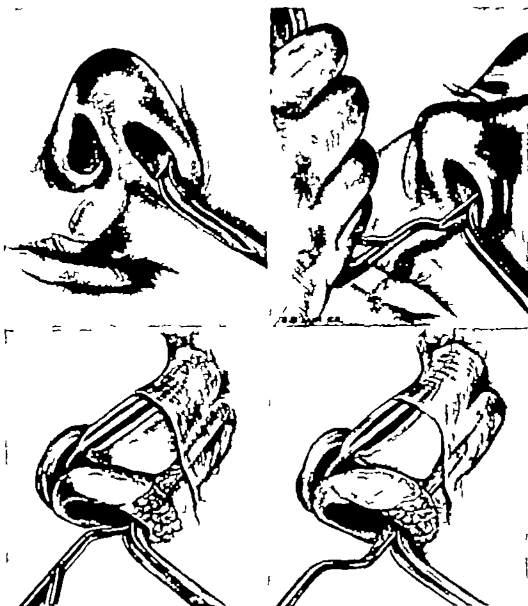


Fig 80 *(Top left)* A grooved director is passed through the opening of the incision to prepare for the use of the right-angle saw *(Top right)* The saw shown in position protected by the grooved director *(Bottom left)* Shows the position of the saw beneath the periosteum at right angles to the bone *(Bottom right)* Direction of the saw in motion cutting through the bone See upper right

by the feeling that the bone is nearly or entirely separated With the retractor still in position the margin of the nostril is drawn upward to expose that part of the upper lateral cartilage still attached to the septum A long nasal speculum (Aufricht) is inserted and



Fig 83 (*Left*) Long nose with slight hump and slight projecting septum (*Right*) After surgical correction

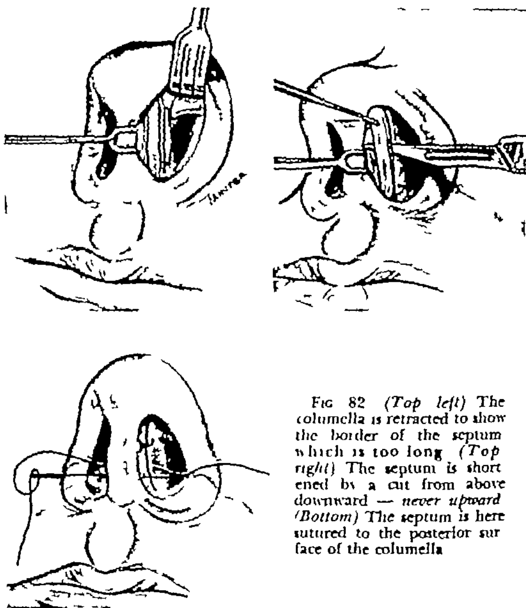


Fig 82 *(Top left)* The columella is retracted to show the border of the septum which is too long *(Top right)* The septum is shortened by a cut from above downward — *never upward* *(Bottom)* The septum is here sutured to the posterior surface of the columella

with a Bard Parker No 11 knife these parts are completely separated

The process of separating the partly sawed bone is completed by the use of a slender grooved chisel 8 inches long and 5/8 inch in width at its greatest diameter The chisel is engaged in the sawline by a few light taps of the mallet The handle of the chisel is then rotated toward the ear and by easy leverage the fracture is completed and the bone fragment is displaced medially When the chisel has been removed, the bone fragment can easily be pressed into the desired position with the thumb

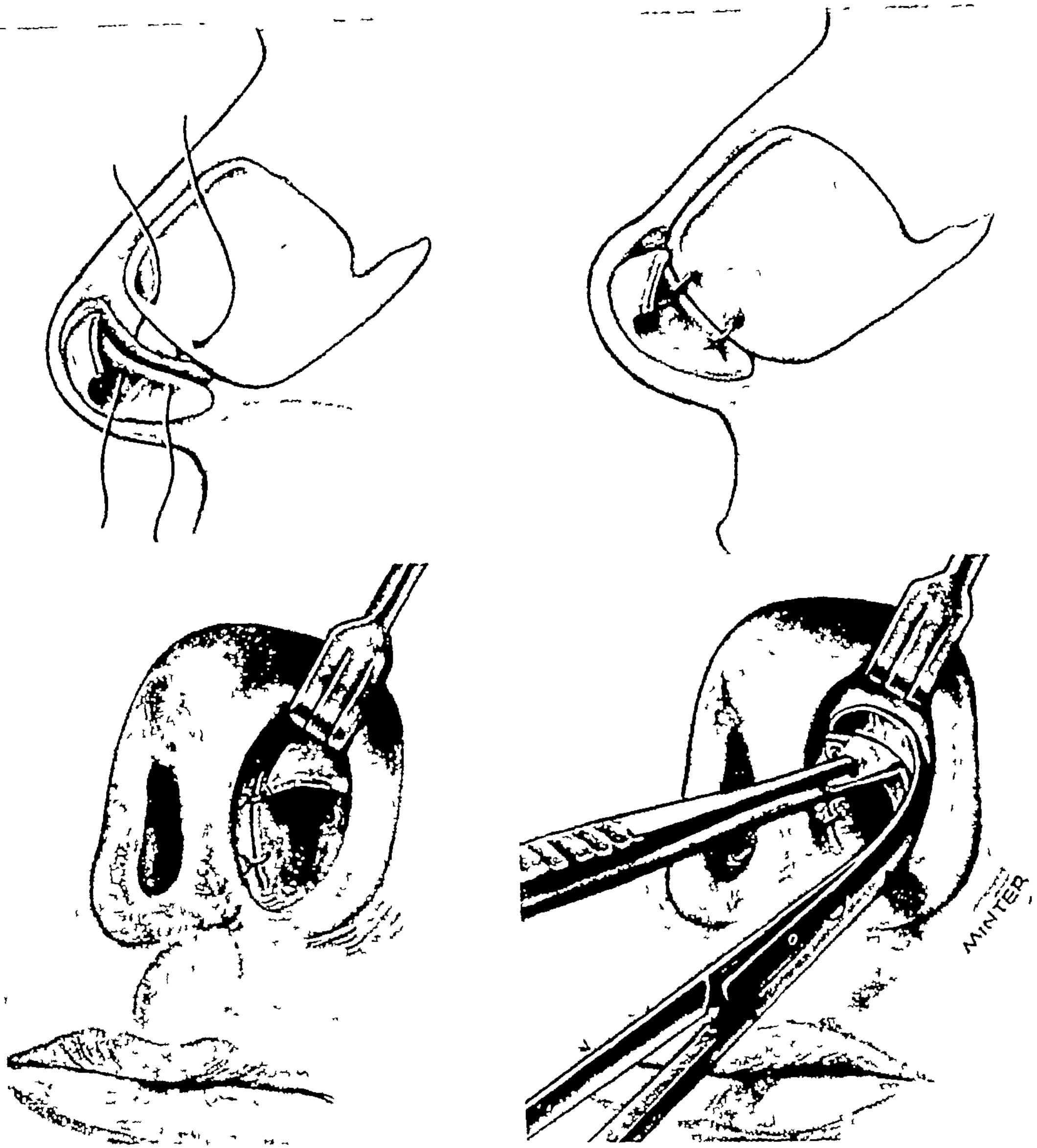


FIG 85 *(Top, left)* Position of two sutures High in the septum and low in the columella *(Top, right)* When the sutures are tied the columella is brought upward to the septum *(Bottom, left)* Showing the upper lateral cartilage, which is now too long and must be shortened proportionately *(Bottom, right)* Curved scissors are used to remove excess cartilage

The writer has found that this technic ensures a cleaner break and is less disturbing to the patient than the customary method of completing the fracture of the bones by manual pressure

SHORTENING THE NOSE

The nose at this point will often appear too long and make shortening of the lower segment necessary

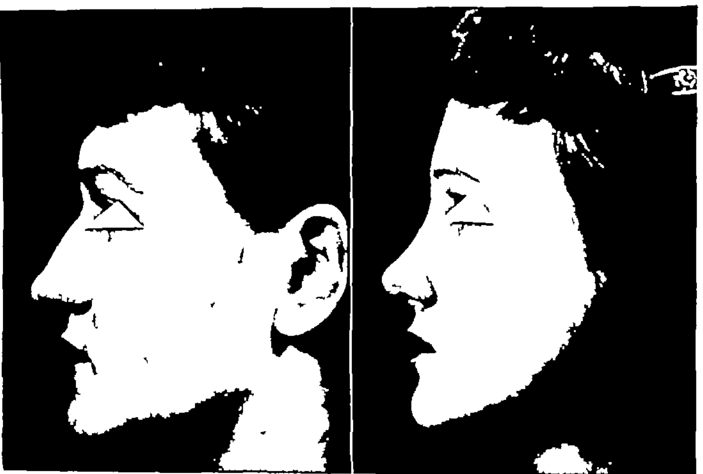


FIG 81 (*Left*) Long nose with low hump (*Right*) After shortening nose and raising tip

This part of the operation includes two processes (Joseph): (1) Shortening of the septal cartilages, (2) shortening of the lateral walls (tip lobule)

Shortening the Septum. The septum being already freed from the surrounding subcutaneous tissues and from the upper lateral cartilages, it is now separated from the lower lateral cartilages through the original incisions The lower border of the septum can now be drawn out into either nasal fossa—preferably the left The amount necessary to create a suitable nasal contour is then cut off with Mayo scissors This should be a triangular fragment, the base of which is uppermost with its apex thus pointing toward the anterior nasal spine When the septum has been replaced, its lower border should be reattached to the columella by means of two heavy black cotton sutures which should pass through the entire thickness of both tissues Absorbable material, such as catgut, should not be used for this purpose

The upper lateral cartilages require shortening to correspond with the new nasal proportions This is done by shortening the nasal walls

Joseph's method was to excise a triangular segment from the upper lateral cartilage together with its investing mucous membrane A simpler method has been found to be preferable This is to cut off with curved scissors that part of the lower border of the cartilage in a line with the original incision In this way all the remaining parts fit together easily

There remains one last procedure to complete the plastic correction of a long hump nose The tip will appear broad and must be narrowed

The anatomic tip includes the lower lateral (alar, tip) cartilages, the columella and the overlying cutaneous and subcutaneous tissues.

NARROWING THE NASAL TIP

A semicircular incision is made within the nasal vestibule just above the alar rim Double-edged scissors are then introduced into the incision between the skin and the cartilage The blades of the scissors are opened and extended posteriorly to the edge of the alar crus laterally and medially to the septum In the same way the inner face of the cartilage is freed from the skin of the vestibule The freed cartilage is drawn out by means of a single-hook retractor and a segment is resected from the angular portion which will correspond with





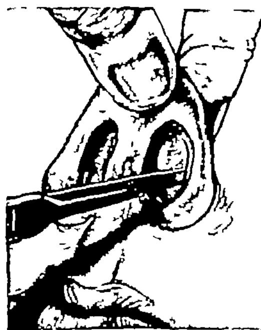




Fig 86 *(Top left)* Nasal tip to be reduced in size *(Top right)* The tip of the nose is lifted upward and backward with finger and thumb to expose the internal surface of the vestibule. *(Bottom left)* The incision is made with a Bard Parker knife No 15 near the rim *(Bottom right)* A similar vertical incision is made along the columella.

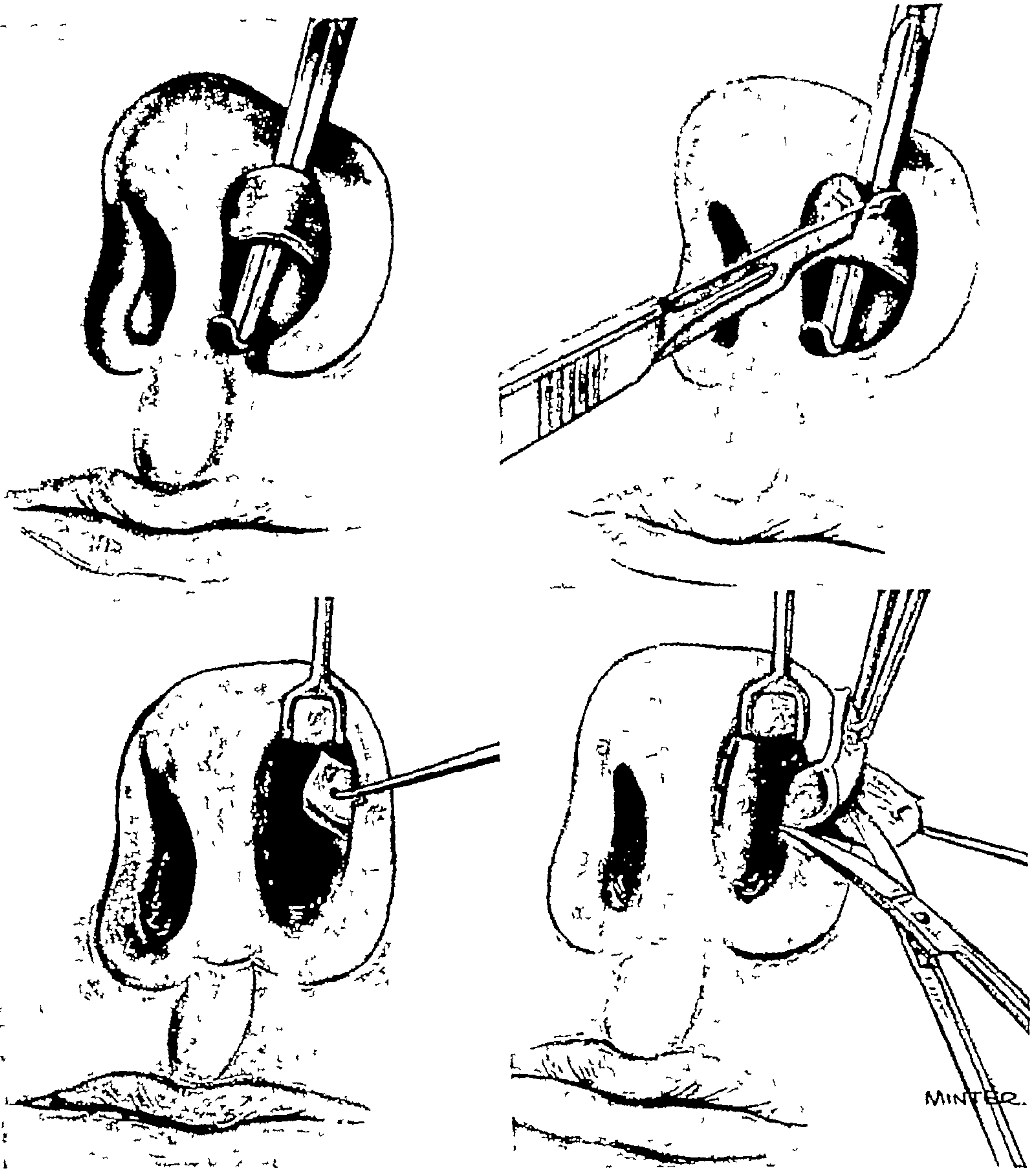


FIG 88 *(Top, left)* Neivert's grooved director is passed under the lower lateral cartilage at the angle *(Top, right)* Incision is made through and through following the groove *(Bottom, left)* The outer portion of the cartilage is held retracted with a single hook retractor *(Bottom, right)* Fine-pointed scissors separate the vestibular skin from the cartilage

the desired nasal contour When replaced, the separated parts of the cartilage will fall together in the midline, and the reduced width of the tip will be represented by the combined widths of the fragment removed from each of the cartilages

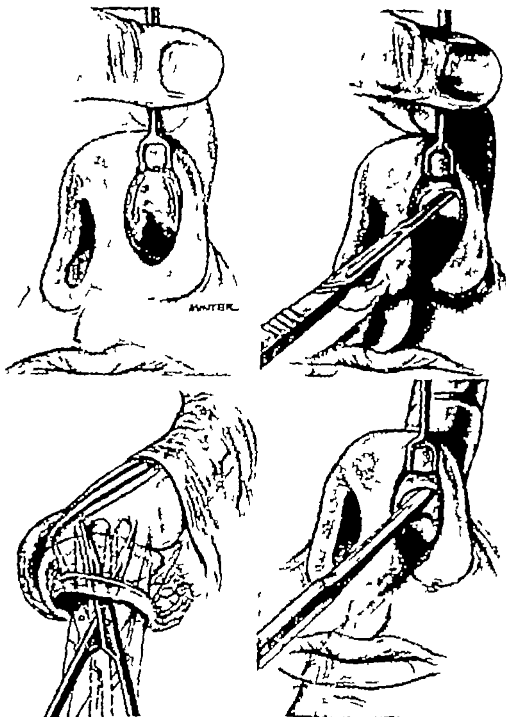


FIG 87 *(Top left)* Using a retractor the position of the incisions can be seen *(Top right)* With a knife the upper ends of the incisions are joined *(Bottom left)* Small double-edged scissors are used to undermine the skin over the cartilage. *(Bottom right)* Neivert's grooved director is here inserted into the incision (Only the posterior surface of the instrument is seen here.)

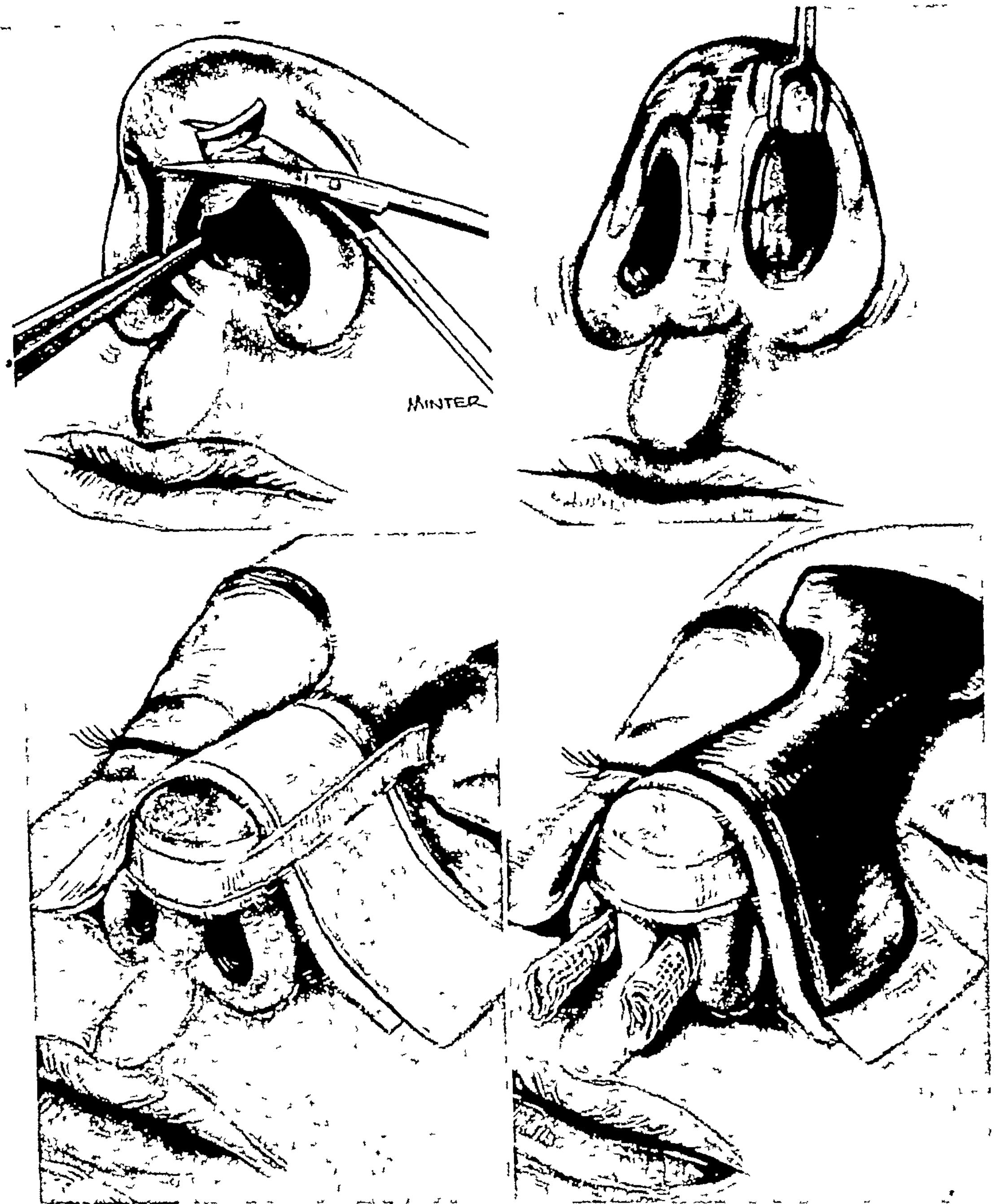


FIG 90 *(Top, left)* The medial crus is properly reduced to lower the height of the nasal tip *(Top, right)* The cartilages now can fall into their natural positions *(Bottom, left)* Dressings according to the Aufricht method *(Bottom, right)* Nasal position and dressings are held by stent (dental compound)

and sulfathiazole The former produces vasoconstriction and the latter acts as a bacteriostatic The packing as a whole supports and helps to keep the delicate cartilages in position. If there is any

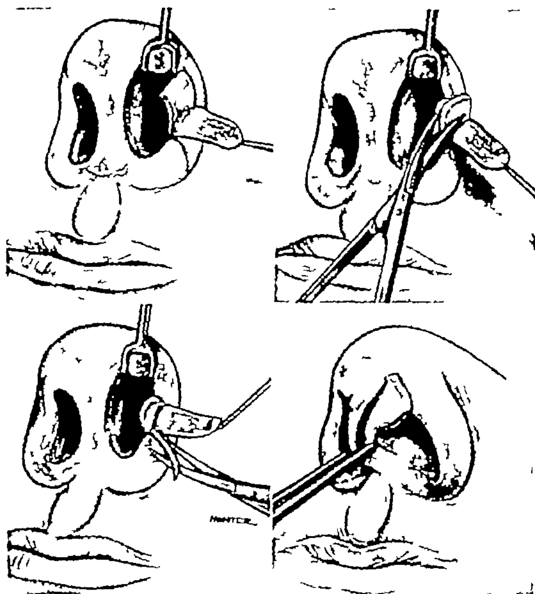


FIG. 89 *(Top left)* The vestibular skin is held retracted from the cartilage *(Top right)* The excess of cartilage is excised with scissors. *(Bottom left)* The lower border of the uncovered cartilage is trimmed off. *(Bottom right)* The columella is turned with forceps to show the medial crura

Dressing Following Aufricht's technic a cast is shaped of Stent's mold compound made pliable in hot water and molded to fit the nose Before applying the cast, all blood and clots should be expressed from the undermined areas

The nasal cavity is lightly packed with a short length of Nu Gauze This prepared gauze is impregnated with kephrine hydrochloride



FIG 92 Postoperative adhesive dressing made of two pieces of tape of unequal length and width put together with their adhesive surfaces apposed and so that only the ends of the longer, narrower strip will adhere to the skin

considerable amount of bleeding, the amount of the packing is increased accordingly to effect pressure

If there is persistent oozing of capillary blood, the writer uses Topical Thrombin The skin or mucous surface is carefully freed from all blood and the preparation is applied either by dusting the dry substance on the surface area or by applying it in solution with gauze Its action is immediate and results from direct clotting of fibrin Care must be taken that it does not enter large blood vessels, since extensive and serious vascular clotting would be caused

The tip cartilages are held in place by applying a narrow band of adhesive across the nose just above the tip and another band over the lower surface of the tip, the ends of which are carried upward



FIG 91 (*Left*) Slight hump with slightly bulbous tip (*Right*) Same after reduction of hump and correction of tip

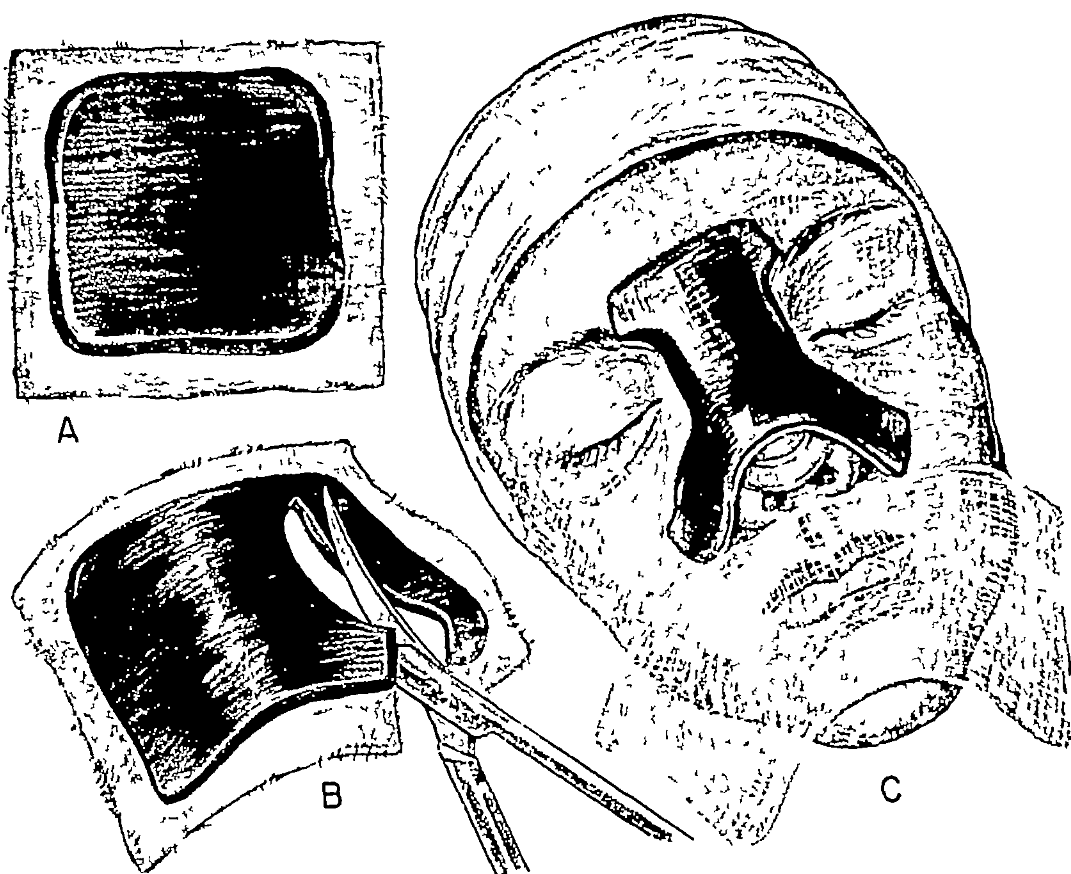


Fig 95 (A) Dental mold compound shown overlying square of flannel (B) Sculpturing the shape of A to fit patient's nose (C) Mold placed in position, leaving eyes free

The cast is lined with a piece of soft cloth which lies against the skin when the cast is placed on the nose This is held firmly in place with narrow strips of adhesive applied across the upper (forehead) and lower (cheek-to-cheek) ends For twenty-four hours a small pad of sterile gauze is strapped over the nares The cast should be removed in from 7 to 8 days

As elsewhere, judgment must be exercised about making use of this type of dressing In situations where frequent examinations may be indicated, the writer employs a mold made of Plexiglas This is plastic when heated and can be molded to fit the new nasal contour When strapped on with scotch tape, the field is visible from the beginning and can be examined at any time without its removal The use of the Plexiglas mold is not limited to any particular condition, as it is equally serviceable in routine operations.

to cross ends of the upper strip on each side of the nose at right angles.

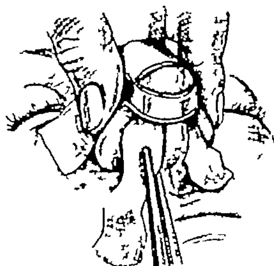


Fig. 93 Tip supported by lubricated gauze packing. This may be replaced by clot-forming gauze, such as Gelfoam (Upjohn) or Oxycel (Parke-Davis) and left to be absorbed.

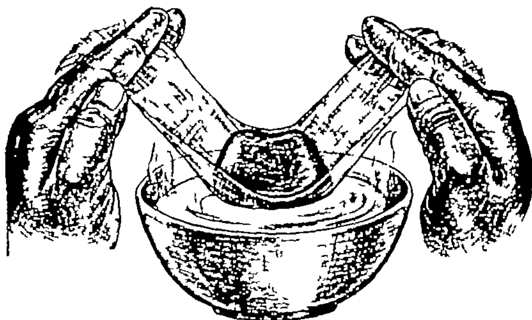


Fig. 94 Dental mold compound is softened by immersion in hot water. Notice manner of supporting it in gauze.



FIG 97 Application of adhesive tape to hold the mold firmly in position over the nose and the mustache gauze pad under the nares after operation

morphine sulfate gr 1/6 to 1/8 with or without atrophine, if there is restlessness or if it is indicated by the degree of discomfort, liquid diet and complete bed care continued

Third Day. Sandbags removed, sitting position, continued liquid diet

Fourth Day. Allowed out of bed, soft diet begins, dressings undisturbed, bathroom privileges permitted

Fifth Day. Dressings renewed by physician.

Sixth Day. Patient allowed to go home Rest in bed recommended Dressings still worn



Fig 96 Application of adhesive strips to hold nasal mold in position after operation. Piece of gauze over mouth kept moist during operation

POSTOPERATIVE MEASURES

The patient is returned to bed and placed flat on the back without pillows. A sandbag is adjusted to each side of the head to limit motion and so prevent possible injury to the operated parts. Iced compresses are used on the eyes to prevent edema and ecchymoses The nasal muscles must remain completely undisturbed, and to assure this all conversation smiling and laughing are forbidden. The diet is limited to liquids and cracked ice may be given The patient must have complete bed care

Second Day Semisitting position dressings remain untouched



FIG 99 (*Left*) Long nose, hanging tip (*Right*) After correction



FIG 98 (*Left*) Protruding nose with large hump (*Right*) After reduction to correspond to facial contour

Seventh Day Patient visits the physician s office The mold and other dressings are removed the nose is carefully cleansed of clots dried blood and mucous by use of hydrogen peroxide cotton applicators dipped in liquid albolene are used to complete the cleansing operation The mold is reapplied The sutures are removed from the septum and the columella

Eighth Day The mold is removed and given to the patient wrapped in a parcel with instructions that it be worn over the nose during the night in bed to prevent possible injury

Tenth Day Patient returns to physician s office The nose is carefully cleansed of all debris with hydrogen peroxide and liquid albolene Any slight corrections of position of nose can still be made at this time

Twelfth Day Adhesive dressing removed finally

If there is too great a degree of edema it can be treated by the application of a Joseph brace for 20 minutes each day This helps to bring the nasal bones nearer together If there should be deflection of the nose the brace can be used to exert pressure to bring it into line



Fig 101 (*Left*) Profile of nose with hump and projecting tip (*Right*) Same after removal of hump and reduction of tip



Fig. 100 (*Left*) Long nose with hump. (*Right*) Same after correction

The patient should return for examination at stated intervals for one year following this operation for general inspection and for nose and throat treatment At first visits are made weekly, then once in two weeks, and later once a month for the remainder of the year The time of these visits must be decided by the physician according to the requirements of the individual case

At the end of six weeks following the operation, photographs should be retaken in the exact position used for preoperative examination

It is emphasized that these rules apply only to uncomplicated cases As a general rule, the less postoperative manipulation of the nose the better But if indicated inspection is made at any time after the operation, no chances should be taken Signs for immediate investigation are complaints by the patient of unusual pain or discomfort about the nose Examination at such a time may reveal areas of redness or even beginning necrosis Treatment of all postoperative complications must be symptomatic

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FIG. 102. Same as Fig 101 Full face before and after reducing hump and shortening nose

second operation is completed one or two months later A final decision rests on the condition at hand rather than any fixed rule

The chief contraindications to submucous resection of the septum are: (1) Hemophilia, (2) general diseased conditions, such as tuberculosis; (3) atrophic rhinitis, (4) infancy

INSTRUMENTS

As elsewhere, the proper instruments help to give success to this operation In this case these are

Nasal specula long and short.
Bard-Parker blades (2)
Dissectors sharp and blunt
Forceps: Luc flat, Jansen, duck-billed, thin bayonet, tissue
Scissors· straight and curved
Chisel and mallet

ACCESSORIES

Basin, towels, strips of sulfathiazole-petrolatum gauze

PREPARATION OF THE PATIENT

Careful general physical examination
Urinalysis
Complete blood count, Wassermann on blood, blood chemistry.
Blood pressure

Two hours before operation a light meal of tea and toast is given Water may be taken up to the time the patient goes to operation

One hour before operation, 3 gr sodium amytal is given

If the patient is unusually nervous and restless, from 1/6 to 1/4 gr morphine sulfate may be given before he is taken to surgery

PREOPERATIVE MEASURES

The face and the nasal vestibules are carefully cleansed with soap and water, followed by 70 per cent alcohol The vestibular hairs are removed with fine, sharp-pointed scissors, particular care being exercised that the skin surface is not injured

Anesthesia is local. The nasal cavities are either (1) sprayed with a small quantity of the anesthetic with epinephrine or (2) packed lightly with cotton pledgets moistened with 4 per cent

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Submucous Resection of the Septum

Septal deflection is frequently present in deformities of the ex ternal nose Septal resection is done primarily to correct this deflection

This abnormality of the septum may be congenital developmental or the result of injury The degree of deflection may be slight or so extreme that it occludes the nasal airway and interferes with normal respiration Removing the obstruction not only restores the ability to breath naturally but it helps the ventilation of the paranasal sinuses and gives access to the eustachian tubes in treatment of ear disorders The entire nose may be distorted as a result of the septal condition

In operating on the septum two basic rules should be borne in mind (1) Avoid injury to the covering mucosal tissues (2) do not remove more septal cartilage than is absolutely necessary for correction or support for the dorsum and the tip will be destroyed and saddle nose will follow

If there is an associated deformity of the external nose, whether or not it is caused directly by the septal deflection or by some other influence it is the writer's custom to correct both conditions in one operation There is some difference of opinion about this method and as is often the case there are two directly opposed points of view One is that a submucous resection should precede any other nasoplastic operation the other just the reverse. The writer has found that they usually can be combined with success. This offers an advantage to both operator and patient without jeopardizing a satisfactory outcome An exception is made when the septum is very markedly deformed then this deformity is corrected first and the

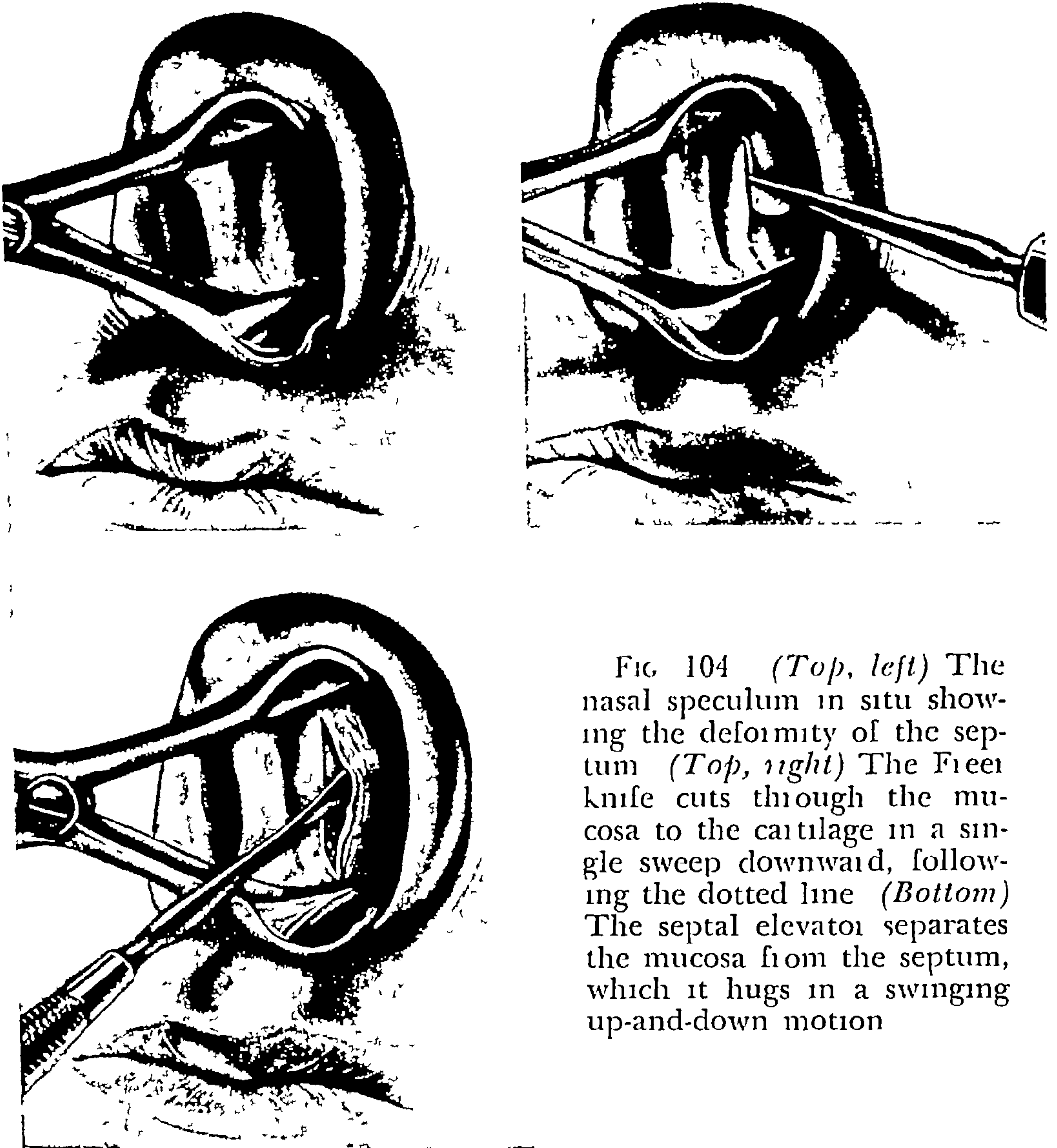


Fig. 104 *(Top, left)* The nasal speculum in situ showing the deformity of the septum *(Top, right)* The Freer knife cuts through the mucosa to the cartilage in a single sweep downward, following the dotted line *(Bottom)* The septal elevator separates the mucosa from the septum, which it hugs in a swinging up-and-down motion

OPERATION

With a speculum in the nostril on the convex side of the deflection, its lower border is located and an incision is made with a fine, sharp knife (Freer) at the junction of the skin of the vestibule with the perichondrium, beginning as near the nasal roof as possible and carrying it down to the floor If the incision is made through the skin rather than through the mucosa, at this line of junction, it will help to protect the latter from being torn The knife should be carried down through the tissues so that the white cartilage appears in the incision

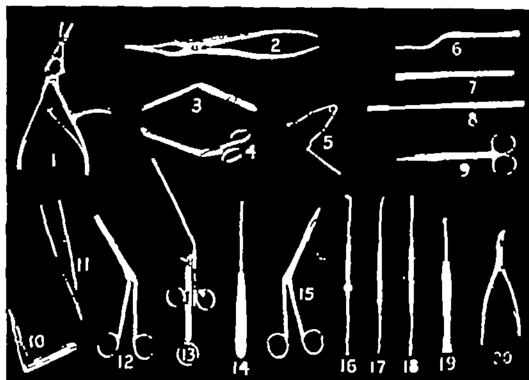


FIG 103 Instruments used in submucous resection (1) Jansen Struycken septal punch. (2) Walsham forceps. (3) Nasal angulated forceps (4) Septal ridge forceps. (5) Self retaining nasal speculum (6) Chisel for vomer (7) Bone chisel (8) Septal chisel guarded (9) Straight scissors. (10) Submucous nasal speculum (11) Forceps (straight) (12) Knight nasal scissors. (13) Krouse nasal snare with wire (14) Septal knife—Ballenger swivel (15) Nasal forceps (Luc) (16) Freer angular knife (17) Freer elevator Combined sharp and blunt. (18) Ballenger elevator and dissector *(19) Freer knife (20) Vienna nasal speculum*

cocaine and adrenalin (Chapter 7) When this anesthetic has taken effect and the packing has been removed a syringe with a fine 6-cm needle is filled with a 1 per cent novocaine (procaine) solution with or without adrenalin and the septum is infiltrated by entering the needle under the mucosa below and midway along the vomer Here from about 3 to 4 cc are injected under the periosteum and the perichondrium The exact amount used can be determined by the blanching of the tissues. This injection serves not only to anesthetize the tissues but to separate the covering layers of tissue from the underlying cartilage and bone Injection is also made along the line of the proposed incision

avoid cutting blood vessels and so causing hemorrhage and tearing the membrane. The separation should be done freely over both cartilage and bone if the condition requires it

The cartilage is cut through along a line corresponding to the original incision, but without incising the mucosa on the opposite side. Through this cut in the cartilage the mucosa is correspondingly elevated on the opposite or concave side of the septum, particular care again being exercised that the membrane is not torn

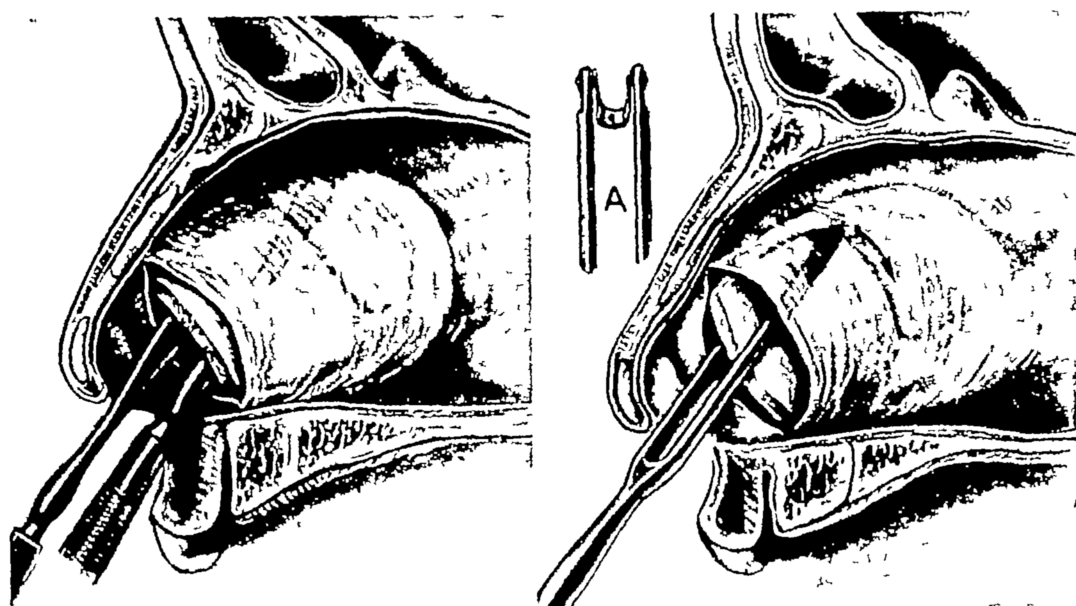


Fig 106 *(Left)* The mucosa is separated from the cartilage by an up-and-down movement of the elevator progressively backward, care being taken that the tissue is not perforated *(Right)* Inset, A, shows the detail of the Ballenger knife The drawing illustrates the action of the Ballenger knife as it cuts through the septum after the cartilage has been freed on both sides from the mucosa

The cartilage has now been freed on both surfaces from the perichondrium The two mucosal layers are separated by means of a speculum inserted with the blades on either side of the septal cartilage With the septum in this way clearly visible, the necessary excision is made by carrying the knife directly backward, and then successively upward and forward, to include all the deformed portion of the cartilage It should always be kept in mind, however, that no excess should be included—only enough to allow the septum to fall into normal relations

If the bony septum is involved, this is incised with punch forceps or with mallet and chisel Punch forceps can also be used to remove

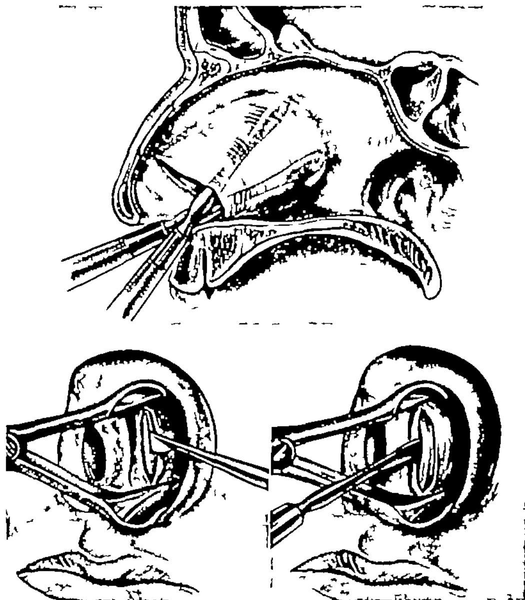


FIG 105 *(Top)* The septal elevator is shown hugging the septum as it progresses backward with an up-and-down movement. *(Bottom left)* The Freer knife as it cuts completely through the septal cartilage but *not* through the mucosa of the opposite side *(Bottom right)* The cartilage is separated from the attached mucosa on the opposite side, after it has been cut through as shown in the illustration to the left.

With a blunt dissector introduced into the incision and carried up over and above the deflection the perichondrium is separated from the cartilage This should be done carefully by keeping just in the level of demarcation between the two elements in order to

avoid cutting blood vessels and so causing hemorrhage and tearing the membrane The separation should be done freely over both cartilage and bone if the condition requires it

The cartilage is cut through along a line corresponding to the original incision, but without incising the mucosa on the opposite side. Through this cut in the cartilage the mucosa is correspondingly elevated on the opposite or concave side of the septum, particular care again being exercised that the membrane is not torn

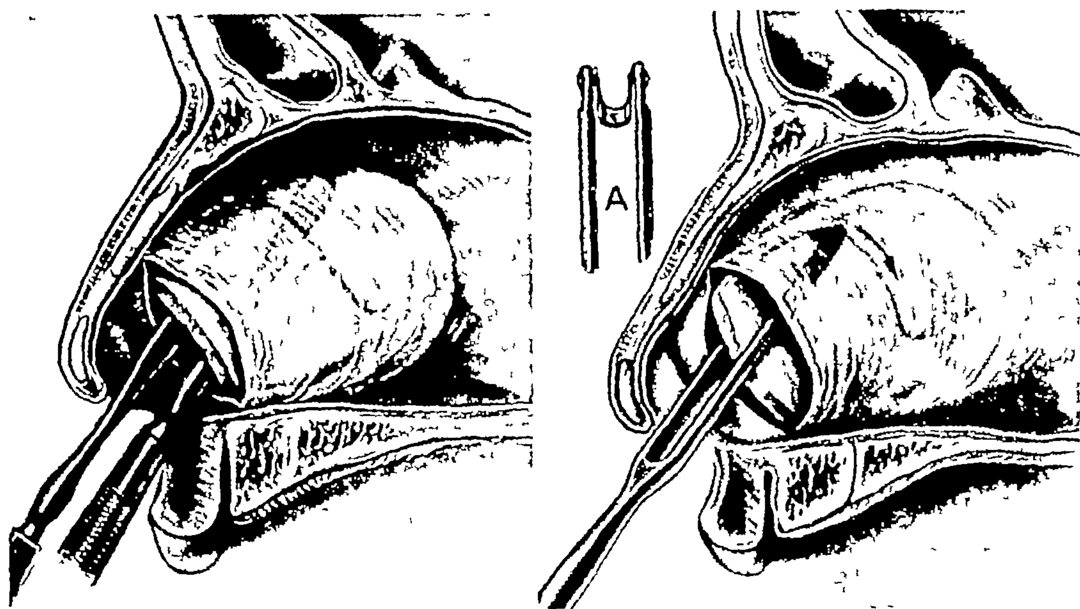


FIG 106 *(Left)* The mucosa is separated from the cartilage by an up-and-down movement of the elevator progressively backward, care being taken that the tissue is not perforated *(Right)* Inset, A, shows the detail of the Ballenger knife The drawing illustrates the action of the Ballenger knife as it cuts through the septum after the cartilage has been freed on both sides from the mucosa

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If the bony septum is involved, this is incised with punch forceps or with mallet and chisel Punch forceps can also be used to remove

the septal cartilage if only a small amount is to be taken away Spurs which may be present on the bony parts are also removed with cutting forceps or mallet and chisel

When the excision is completed the cartilage can be removed easily with forceps and the space now present between the two

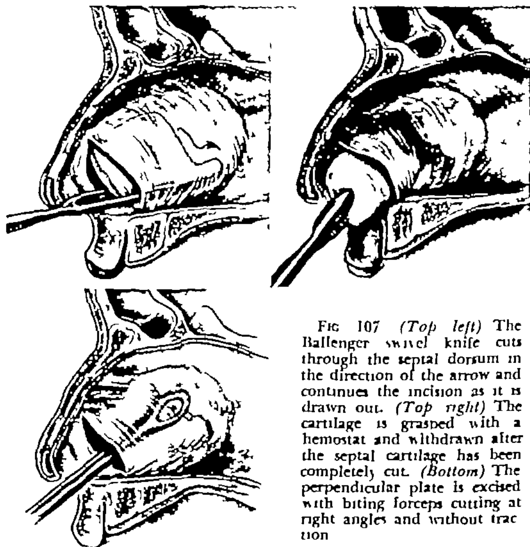


FIG 107 *(Top left)* The Ballenger swivel knife cuts through the septal dorsum in the direction of the arrow and continues the incision as it is drawn out. *(Top right)* The cartilage is grasped with a hemostat and withdrawn after the septal cartilage has been completely cut. *(Bottom)* The perpendicular plate is excised with biting forceps cutting at right angles and without traction

mucosal layers is cleaned of all fragments of bone cartilage and blood clots by means of Jansen or Luc forceps or by irrigation with normal saline solution The two mucosal layers are then allowed to fall together and the incision is closed with two or three sutures

Dressing Strips of petrolatum-sulfathiazole gauze are placed in each nasal fossa to keep the mucosal layers in contact. The dress-



FIG 108 *(Left)* Unequal nostril due to deflected septum *(Right)* After correction

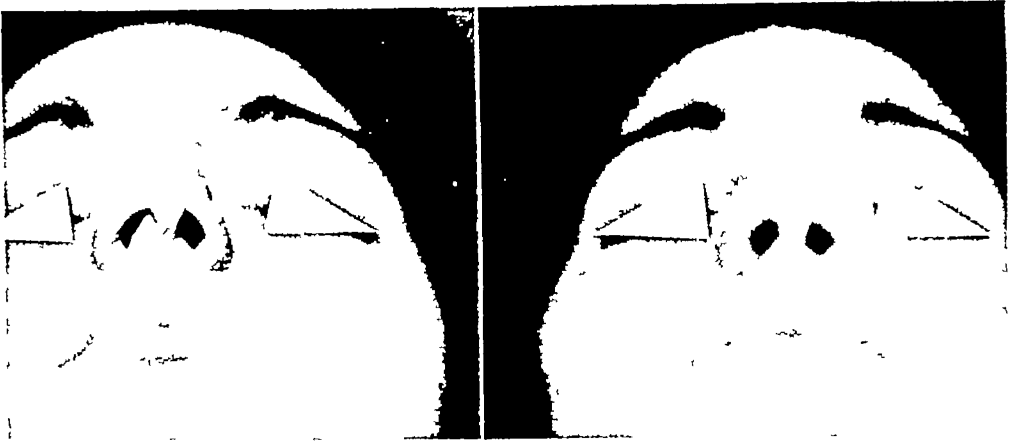


FIG 109 Deflected septum producing deflected tip Before and after correction



FIG 110 Deflected septum before and after operation

ings are removed the following morning, and the nose is irrigated with warm saline solution The patient should be instructed not to blow the nose for a few days, then it should be done carefully, always with one side open, to avoid undue intranasal pressure

COMPLICATIONS

Some bleeding always follows the operation and can be controlled with cold compresses If the bleeding is severe the nasal cavity is *packed for twenty four hours but not longer If unusually persist* ent and extreme hemorrhage occurs the postnasal space should be packed

Blood may accumulate under the mucosal surface to form a hema toma. Small ones will not need attention as they are soon absorbed. In the case of large hematomata evaculation should be done through the original intranasal incision and a pressure dressing applied for twenty four hours

A septal abscess may develop from an infected hematoma There will be pain rise of temperature and nasal obstruction The abscess should be evacuated. The use of sulfathiazole lessens the incidence of infection and experiment with penicillin is proposed

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13

Saddle Nose

Saddle nose is not only one of the most common nasal abnormalities it is the most disfiguring one when present in an extreme degree Its correction is indicated and always justified with the possible exception of those few neurotic individuals who are never satisfied by the outcome of any mode of treatment and of frankly psychotic patients on whom an operation should never be undertaken In the case of infants or young children operation should always be delayed until after mature growth has been attained unless there is nasal obstruction which is harmful to the health of the child Early operation often results in secondary deformity when the nose grows larger during the period of puberty

The condition of saddle nose may be congenital or acquired When it is congenital it may be either hereditary or developmental The hereditary condition may be either racial (Negro) or familial

Acquired saddle nose results most often from injury by accident. Not infrequently it is the outcome of an unsuccessful submucous resection of the nasal septum with or without infection Lues is the most common agent of primary infection causing saddle nose with consequent destruction in varying degrees of bone and cartilage

Concavity of the nasal dorsum is not however always true saddle nose Undue prominence of the nasal tip alone may produce a concave contour although the dorsal profile itself may present a normal outline This condition can be definitely determined by careful examination with the photometer

Joseph classified saddle nose under three main headings

1 Simple with nose of normal length This requires only restoration of the destroyed framework The simple type occurs in two forms (a) Without loss of support for the nasal tip (b) with loss of such support

2. Complex, with normal length This requires restoration of both framework and overlying skin

3 Saddle nose with shortening This requires restoration of framework, skin and mucous membrane

For restoring the inadequate framework in saddle nose, grafts have been used that were made from a large variety of materials In choosing graft material, it should be borne in mind that experience has shown that the power of regeneration is least in tissues of greatest differentiation, that the material to be transplanted must have the power, when separated from its original nutritive source, to survive until connections are established in its new environment The individual's own tissues (autografts) and one with the same histologic structure as that to be replaced assure the best result

The materials which have been used with the most uniform success are cartilage and bone

Cartilage grafts have been derived from a wide variety of sources They may be homografts (from other human material) or autografts (from more or less distant parts of the patient's own tissues) Such grafts have most frequently been taken from the upper or the lower lateral nasal cartilage of the patient, or from the nasal septum, when the space to be filled was only slight For a larger amount of graft material, cartilage has been used from the auricle, and more often from the costal cartilage Cartilage for use in nasal restorative operations has also been obtained from the tissues of suitable cadavers

Bone grafts have been taken from the finger, the rib, the anterior border of the tibia and the iliac crest When saddle and hump nose are combined, the excised hump can be utilized to fill the concavity below If the depressed area is limited to the bony portion of the dorsum, by fracturing the nasal bones where they join the bony septum, also the frontal process of the upper maxillae and the frontonasal articulation, these parts together can be elevated and immobilized in proper position until union takes place

When the saddle deformity is confined to the upper cartilaginous dorsum, by separating the upper lateral cartilages from the septum and the maxillae, they can be elevated to the desired position by manual manipulation and immobilized by passing two sutures through the entire nose

Paraffin has also been employed in nasoplastic operations but with little success Injected under the skin in the melted state it can then be molded as it solidifies to create any desired contour but the results of its use have not been satisfactory It may cause inflammatory tissue reaction or paraffinoma with disastrous results. Its removal is usually necessary and is a very difficult procedure besides making later reconstructive operation the more involved. Its use in rhinoplasty is not recommended

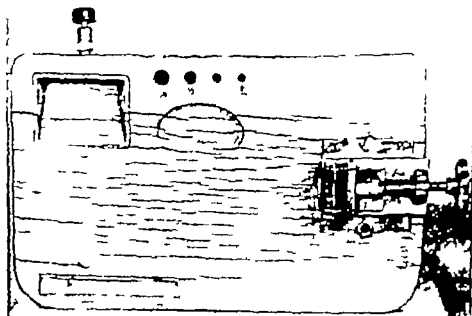


FIG. 111 Author's plastic-surgery board *(Top left)* Tray for waste materials graded perforations for measuring graft oval receptacle to hold prepared graft. *(Bottom left)* Scale for measuring length of graft. *(Right)* Vise to hold graft when modeling

PRELIMINARY STEPS TO OPERATION

1 The patient's facial mask is first made of plaster wax (or dental compound) according to directions already given (Chap. 8) Using the cast, the nasal defect is filled in with the softened modeling substance and molded to suit the desired nasal contour These measures provide a pattern for shaping the graft to be implanted

2 For preparing the graft the writer uses an operating board of his own design This is of white oak 18 x 12 x 2 inches in size, and can be sterilized.

(a) A small pocket is hollowed out near the upper left-hand corner, where the graft is kept moist in fluid blood until ready for use A spigot allows the fluid to be drawn off as required.

(b) Four small holes of suitable depth are just to the right of the corner pocket, with their diameters carefully graded to 5/8, 1/2, 3/8 and 1/8 inch. The size and the length of the graft are determined by the use of these measurements.

(c) At the lower left-hand corner, a 6-inch metal scale is inlaid to provide a constant and convenient means for measuring the dimensions of the graft.

(d) At the right-hand margin of the board a vise is attached which serves to hold the graft material firmly while being modeled. A rotary pencil sharpener is also installed here for use in shaping and smoothing pointed ends of grafts

(e) Using the mask, cast and modeled pattern, the graft is then carefully prepared and allowed to remain in the fluid bath on the operating board until the field of operation is ready for its reception

PREOPERATIVE MEASURES

As already described in Chapter 7, preoperative measures are carried out The operating room is prepared with attention to strict asepsis The patient is made ready by careful preparation of the field of operation

THE OPERATION

Different operative routes have been used by many operators These were in a measure determined by the degree and the type of deformity—whether the repair required only transplant, as in the simple type, or whether a more extensive restoration was demanded by the complex types, which require not only the implanted dorsal graft but skin grafting and restoration of mucous membrane

The intranasal route avoids visible scars and is generally preferable This discrimination has been disregarded by some operators Although Joseph preferred the intranasal method he also operated for saddle nose by making the primary incision along the upper alar furrow Lexer used an external incision at the root of the nose (glabella) At present this method is rarely employed It is useful only where a very disfiguring scar has been removed from the nose and a pedicle graft from the forehead is employed to fill the de-

nuded nasal area In this situation there is already a glabellar incision which can be utilized to avoid an additional intranasal one.

On two occasions the writer has inserted the graft through an

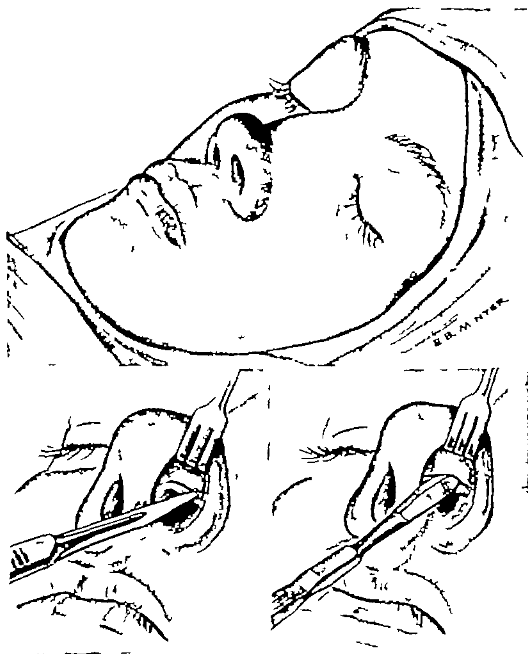


Fig 112. *(Top)* Position of the head prepared for surgical correction of saddle nose *(Bottom left)* Primary incision with Bard Parker knife No 11 *(Bottom right)* Undermining through original incision with Joseph double-edged knife

incision made in the inner extremity of one eyebrow, undermining downward over the nasal dorsum

Gillies reports separating the lower border of the columella at its junction with the upper lip (philtrum), dissecting it away to the nasal tip, then undermining the skin over the nasal dorsum from this position. After insertion of the transplant, the columella is sutured in its original position

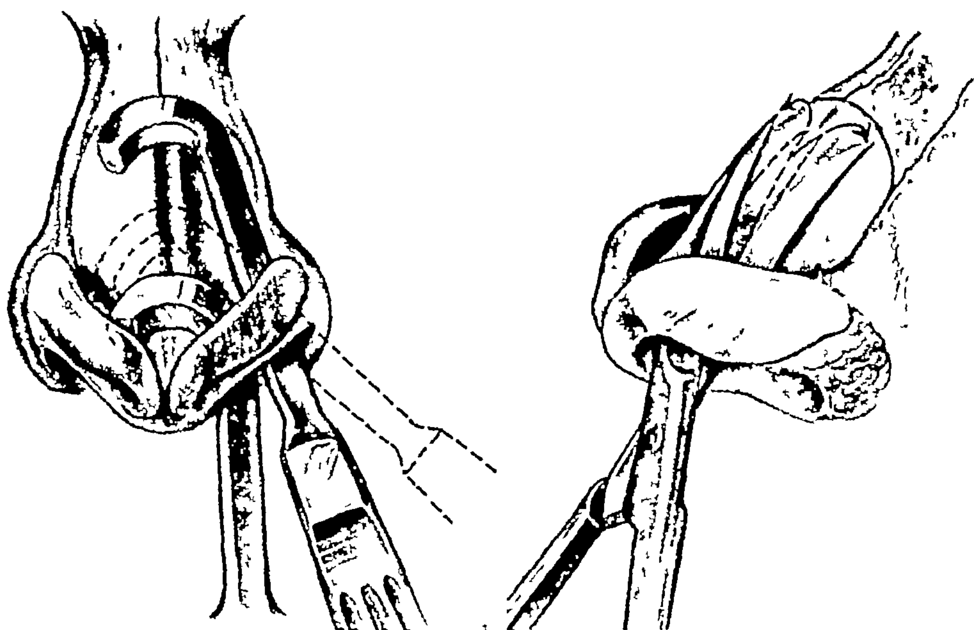


FIG 113 *(Left)* Undermining the skin with an upward and downward stroke of the Trelat knife *(Right)* Separating adherent undermined tissue with curved scissors

SIMPLE SADDLE NOSE WITHOUT LOSS OF TIP SUPPORT

1 With the tip of the nose retracted, an intranasal incision is made along the lower border of the left lateral cartilage

2 Through this incision, the skin over nasal defect is carefully and thoroughly undermined somewhat beyond its immediate borders to avoid tension over the implanted graft If the extent of the defect involves the entire dorsum, undermining should be carried down to the nasal tip This entire process can be carried out through the original incision by the use of a knife (comma) which is sharply curved on the flat With this knife, the skin can be freed on both sides of the nose and the alar cartilages can also be separated When the graft is to overlie bone, the preparation of

the pocket to receive it includes elevating the periosteum as well as the skin

3 Insertion of Transplant The pocket is ready for the reception of the transplant which has been prepared from an excised iliac crest. With a small flat retractor an assistant draws up the left ala and a flat guide is entered through the primary incision. With a small hooked retractor the upper margin of the incision is drawn upward to hold the opening of the pocket apart Held with

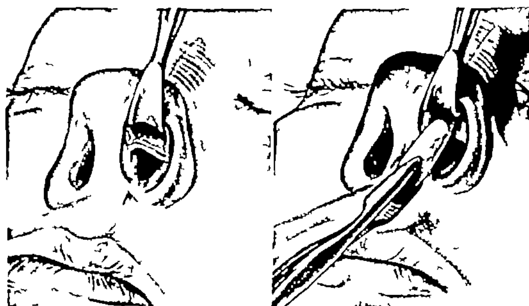


FIG 114 *(Left)* Mouth of the incision held open with retractor *(Right)* Cartilage implant inserted with hemostatic forceps.

the bone forceps the graft is introduced along the flat guide care being taken that the surrounding nasal surface is not touched to avoid possible infection. The transplant is manipulated with the overlying palpating fingers until it is in the desired position The incision is not sutured.

4 Packing is limited to a small amount of Nu-Gauze placed within the nostrils.

5 External dressing consists of softened dental compound molded along each side of the nose about the graft. This is covered with a pad of gauze and all is held in place by adhesive plaster

If the saddle nose deformity presents an unusually broad base, there should be a two-stage operation for its correction First, the nose is narrowed as already described (Chap 11) and only after the



FIG 115 *(Left)* Saddle deformity corrected by cartilage implant *(Right)* Position of implant maintained by two layers of adhesive of different widths

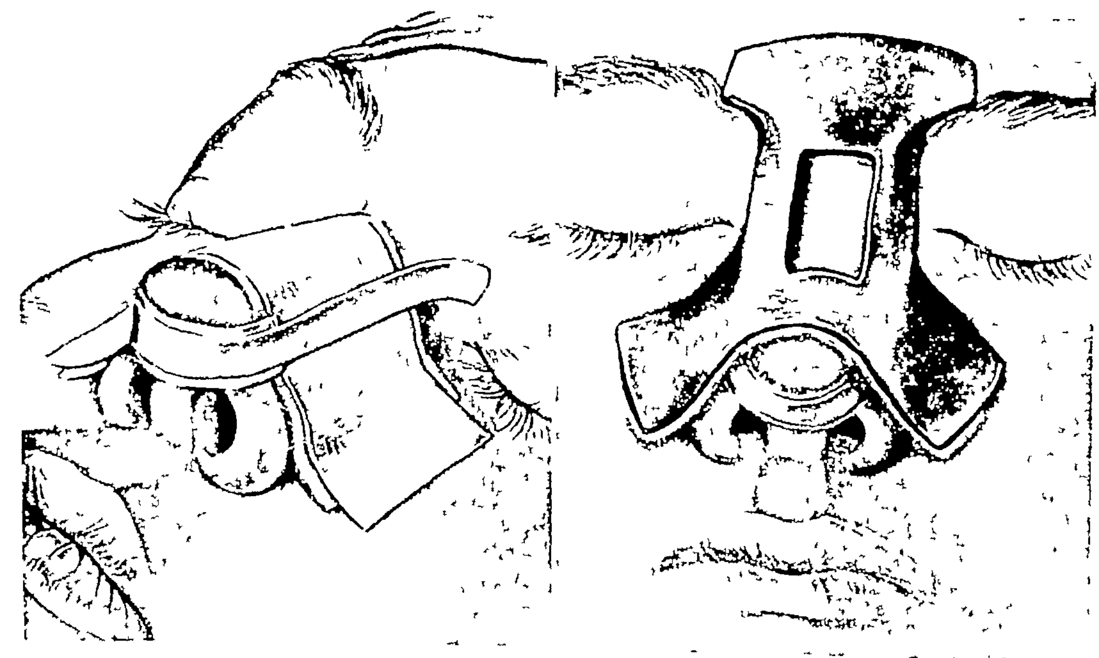


FIG 116 *(Left)* Addition of a narrow strip of adhesive lined with a wider piece that has its nonadhesive surface next the skin of the nose to form a close-fitting nasal splint *(Right)* External splint of dental mold compound with opening at center to ensure position of graft

postoperative reaction has cleared is the implant inserted over the narrowed dorsum

SIMPLE SADDLE NOSE WITH LOSS OF TIP SUPPORT

This type of deformity is most often due to accidental injury or to infection or it is the consequence of an unsuccessful submucous resection of the septum in which there is commonly considerable destruction of the cartilaginous septum To restore support for the nasal tip and also repair the saddle defect a two-piece graft is employed A long piece of cartilage is sculptured to the required size

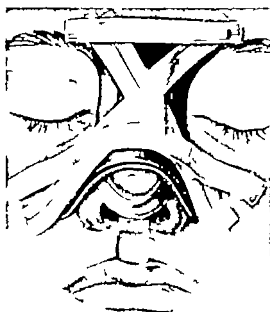


Fig 117 Dressing of dental mold compound lined with flannel and held in place by strips of adhesive plaster

and shape with an angular section carved out at a point which represents the length of the nose from its root (glabella) nearly to the nasal tip This allows a sharp bend in the graft at the point corresponding with the desired tip support. A small strip of periosteum is left intact at this point where it acts in a hingelike manner Elsewhere the periosteum is completely removed from the graft. The shorter arm of the graft represents the distance from the proposed nasal tip to the anterior nasal spine A longitudinal incision is made through the midline of the columella through which the skin



Fig 118 (*Left*) Saddle type of nose with retraction of tip (*Right*) The same after correction with cartilage implant, which lowered the nasal tip



FIG. 119 (*Left*) Saddle deformity from unsuccessful submucous resection by inexperienced operator (*Right*) After reduction of hump and elevation of depression by implant of patient's own cartilage.



FIG 120 *(Left)* Saddle nose *(Right)* After correction by use of ivory implant

over the nasal dorsum is undermined sufficiently for a pocket to receive the graft The long arm serves to fill in the dorsal effect, and the shorter arm acts as a strut to support the nasal tip After the graft is securely in position, the operation wound in the columella is sutured and an external molded plexiglas splint is applied to hold the parts in place until they are firmly organized

COMPLEX SADDLE NOSE WITH LOSS OF BOTH FRAMEWORK AND OVERLYING SKIN

The common causes of this type of deformity are severe injury through accident, acute infection in infancy with destruction of the nasal cartilages or later infection of lupus vulgaris. In this condition (1) the tip may be in the normal position and the dorsum largely replaced by scar tissue, (2) destruction of the soft tissues



Fig 119 (*Left*) Saddle deformity from unsuccessful submucous resection by inexperienced operator (*Right*) After reduction of hump and elevation of depression by implant of patient's own cartilage.

may have caused extreme retraction of the tip, with relatively intact framework, (3) the nasal tip is normal, but extreme destruction of the skin and underlying soft tissues over the nasal dorsum may have left an opening into the nasal passages

In all these conditions there is a loss of soft tissue resulting in excessive scar formation over the depressed area Simple introduction of a graft to restore the dorsal contour is insufficient, since the scar tissue has poor vascular supply and lacks elasticity, so that too great pressure is exerted on a transplant. This very often results in widespread tissue necrosis For this reason, grafts both for support and for skin replacement must be used

Tip in Good Position This operation must be done in two stages In the first, all scar tissue must be excised A pedicle flap is prepared from the forehead with the attachment of the pedicle in the region of the right eyebrow, then sutured over the right side of the nasal operative field and part of the dorsum The pedicle is not disturbed until the right side of the field is fully healed and the graft manifests a well-nourished condition At such time, the pedicle is severed and the redundant portion is turned down over the left side of the field of operation This covers in the saddle defect with a single skin graft.

In the second stage, after the skin graft is well established, a transplant, preferably of cartilage or cancellous bone from the iliac crest, is inserted through the original glabellar incision for the skin flap. If the nasal contour is not at once entirely satisfactory, remodeling of the skin graft can be done later to secure the desired cosmetic result

Tip Retracted. When there is destruction of the skin, with excessive scar formation and with loss also of supporting framework and mucous membrane, an incision is made through the entire nose from the upper margin of one ala to that of the other This leaves the nasal tip attached only about the alae and the nasolabial junction In this condition the tip can be placed in any desired relation to its surroundings, leaving a broad open space upward as far as the glabellar region Should there be any normal skin on the upper dorsum or on the lateral nasal surfaces, these are carefully dissected up but left attached to form a flap which can be turned inward to serve as a lining of the nasal cavity if the normal mucous membrane has been destroyed. The operation is further completed in a man-



FIG. 121 (*Left*) Saddle deformity of cartilaginous nasal vault following submucous resection (*Right*) Same nose after correction of the deformity by means of a cartilage implant



Fig 123 (*Left*) Traumatic saddle nose (*Right*) After cartilage and bone-graft replacement



FIG. 122. (*Left*) Depressed nose with saddle deformity. (*Right*) Correction by cartilage implants both to raise the bridge and the upper lip at the nasal border



FIG 125 *(Left)* Nasal deformity from collapse of middle third following submucous resection *(Right)* After correction by cartilage implant



FIG. 124 (*Left*) Showing saddle nose from collapse following removal of too much septal cartilage in submucous resection. (*Right*) After correction.

ner similar to that described for operation when the tip is in good position

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Fig 126 (*Left*) Saddle nose (*Right*) After correction with cartilage graft implant.

mined that these hereditary factors have their anatomicophysiologic substrate in particulate substances which are present in the parent cell chromosomes as units called genes.

The questions of heredity are complicated by the theories which have been presented that genes subjected to abnormal conditions after fertilization of the ovum may respond in a change of their manner of action. Regarded as specific bodies of the nature of enzymes, genes act as catalysts, each according to its individual character In the normal process of time, differentiation and growth and certain continuous causes and effects follow each other with fixed regularity The introduction of an influence that is disturbing to this orderly activity will alter the interacting factors with corresponding change in the resulting effect in this way the characters of genes may be altered and the final outcome may appear in the nature of a deformity of the embryo Although this abnormality is not at this point one of a hereditary nature, it may appear as such in succeeding generations

In the light of repeated experiment, it is evident that many deformities which were formerly considered as of hereditary origin may actually be the result of deficiency states or other related condition in the mother during the period of fetal development. However, departures from the normal are seen which are obviously familial and directly hereditary. The writer has reported a case in point of direct heredity in rhinophyma.

The hereditary nasal conditions seen most frequently by the plastic surgeon are congenital hump nose and saddle nose These are not true deformities in the strict sense of the word, since they are only focal exaggerations of the normal nasal contour In effect, however, they may occur in a degree which makes operative remodeling desirable for the satisfaction and welfare of the individual

Since the line of demarcation cannot be drawn sharply between the congenital abnormalities, they will be given consideration mainly as developmental.

DEVELOPMENTAL DEFORMITIES

Included in this group are.

I Those abnormalities which arise directly from mechanical influences exerted during the prenatal and the birth periods. The

14

Nasal Deformities

The nose is subject to a number of deformities and malformations which are the result of various influences and which require correction by plastic surgery Some of these conditions are seen frequently by the plastic surgeon others rarely

Defect may be complete in the external nose involving both the upper the middle and the lower thirds or it may be only partial affecting only a single segment or combination of any two parts In the latter case the alae the tip or the septum may be involved separately or in combination

When the upper and the middle parts of the nose are affected the supporting framework may be distorted but with normal skin covering as in saddle nose There may also be defects of the skin and the mucosa abnormal nasal openings and fistulas A wide variety of causes can result in the same deformities

To explain the presence of congenital septal distortions a theory is frequently presented that an evolutionary change takes place (phylogenesis) in the forms of different bones in the area concerned by which a lack of balance is created between the facial and the cranial components of the skull thus producing a distortion of the nasal bones Overdevelopment of the vomer may crowd against the descending perpendicular plate of the ethmoid causing distortion of the septum and displacement and asymmetry of the nasal structures which depend upon it for support

Abnormalities of the external nose fall into three general classifications, according to their etiology Two are congenital (heredity developmental) and the third group is acquired

HEREDITARY DEFORMITIES

In the case of direct heredity the dominant factor must of necessity be present from the beginning since it is already present in the ovum or the sperm or in both The study of genetics has deter

causes of many of these deformities are not definitely known, although there are theories concerning them

There are distortions and displacements which are generally considered as resulting from unusual intrauterine pressure, possibly consequent upon too little amniotic fluid, abnormal position of the fetus or the presence of adventitious bands and adhesions More easily demonstrable are those which appear to be caused by injury in passing through the birth canal The most common of these result from the pressure on the face in the aftercoming head, and particularly from injuries to the face in forceps deliveries

2 Developmental abnormalities which are not mechanical in origin Much information on this question has been secured by experiment with lower forms of life and by careful study of human cases

Extensive investigations (Stockard) in which fish eggs have been subjected to abnormal temperatures and to chemical influences have resulted in abnormally developed embryos These and other studies have shown that the nature of the acting substance and particularly the stage of embryonic development at the time the influence was applied are important factors in determining the degree and the type of malformation which result This importance has been emphasized in man by the observation that rubella in the mother during the first three months of pregnancy causes congenital cataracts in a large percentage of embryos, together with the less frequent occurrence of other developmental anomalies

A careful examination (Murphy) of 500 families in which congenital malformations were present demonstrated that of the more than thirty different lines of inquiry pursued, the only one in which positive findings were common to the group studied was in relation to inadequate maternal diet preceding pregnancy The dietary deficiencies were in calcium, phosphorus, iron and vitamins B, C and D The general conclusion was drawn that human malformations of the nature of those included in that study result from harmful influences which act upon the unfertilized ovum

Experimental study of this question carried on with rats (Warkany) demonstrated that it was possible to "produce a characteristic pattern of developmental defects" in the young of female rats which had been fed a riboflavin-deficient diet. Cleft palate and cleft lip are among the frequent deformities in this group Malformations



Fig 127 Hereditary rhinophyma (*Left*) Before operation (*Center*) After removal of hyperplastic tissue. (*Right*) After implant of cartilage graft.

flat The internal nose was normal. The ethmoidal cells were not developed

(c) One lateral half of the nose may be normally developed, with the other half completely lacking

(d) One half of the nose may be developed relatively normally and the other half be represented by a tube of tissue, which may be attached at various points along the line of embryonic fusion between the anterior maxillary process and the frontonasal process This member may even be present above the orbit (eyebrow)

(e) A degree less than the foregoing may appear as one or more supernumerary nares, along this same line of fusion in the embryo

(f) Reduplication of the cavities of the external nose may be caused by transverse bands which form paired nostrils

(g) Fistulas may occur at any point along this same line of fusion Some of these openings may be surrounded by more or less hair growth

(h) There may be an entire lack of development of the external nose The nasal area of the face then appears as a flat surface with two openings corresponding to the anterior extremities of the internal nasal cavities which may be normal

5 Partial lack of fusion between the lateral and the median portions of the ethmoid may result in cephalocele (meningo-encephalocele, cranium bifidum) into one of the posterior nasal cavities This condition, which is etiologically the same as meningocele of the cord (spina bifida) is rare, and because this is so, its differential diagnosis is of considerable importance Cephalocele appears in one nasal fossa in relation to the turbinates as a smooth, grayish, fluctuant, pulsating mass, varying in size according to the degree of the skull defect It should be differentiated from polyp or tumor arising from the mucous surface It requires intracranial operation, which places it in the field of neurosurgery for treatment

6 Choanal atresia, if typical, is said to be always congenital More often unilateral, it may be bilateral It represents a state of imperforation The obstructing tissue may be bony or fibrous There may be (a) persistence of the embryonic nasobuccal membrane, (b) medial overgrowth of the palatal processes, (c) inflammation (intrauterine) of the nasal passages (atresia) The outstanding symptom in the newborn is difficulty in breathing, or, if the condition is bilateral, there is mouth breathing

of the soft tissues also may be present. In one group of 300 young born to mothers on such a deficient diet, 14 7 per cent had cleft palate

In a study of 216 human subjects the greater number of babies (stillborn) with well-defined congenital defects were born to mothers whose diets during pregnancy were inadequate.

There are a great many deformities which result from gross defects in the development of the embryo Fortunately such conditions are comparatively rare The most common one of this group is (1) cleft lip (harelip) The cleft may be only partial or it may be complete with extension into the floor of the external nose. The cleft may be present only on one side or it may be present on each side of the central portion of the lip (philtrum) A median cleft of the upper lip also occurs The cleft may be much more extensive and involve a part or the whole of the palate appearing either in the hard or the soft segments of the palate or in both at the same time These defects follow the lines of the nasomaxillary fusion in the normal embryo

2 Bifid nose is relatively rare. It represents a developmental anomaly in which there is a disturbance of development which appears along the line of the nasal dorsum As in others of these malformations the degree may be slight and appear as a more or less shallow furrow limited to the tip region or the entire dorsum may be widened (dog nose) The defect is sometimes extreme to the degree that the entire nose and the midline of the upper lip may be completely divided.

3 The nasal tip alone may be developmentally distorted by lack of normal formation of the lateral walls which appears as a notch on either side of the upper extremity of the columella and results in the protrusion of the anterosuperior angle of the cartilaginous septum

4 Not only simple defects but also widely aberrant anomalies are seen

(a) Two distinct and completely formed nasal organs may appear side by side

(b) A very rare case has been reported where there was a reduplication of the external nose arranged longitudinally as an upper and lower segment, the nares of the upper portion lying about midway the length of the entire formation which was long and



FIG 128 *(Left)* Depressed and deflected tip with wide cartilaginous bridge *(Right)* After submucous resection and complete nasal reconstruction

Tuberculosis of the nose is not common It may appear in a proliferative or in an ulcerative form The lesion appears most often in the cartilaginous septum, but may also involve the turbinates and the bony parts It is usually unilateral The proliferative form may appear as a large tuberculoma As in other chronic ulcerative processes, the plastic surgeon is concerned only with the repair of the late destructive manifestations, and usually only after all active disease process has been terminated

Lupus There are a number of conditions designated as lupus which are clinically somewhat similar but which differ in etiology and present a distinctly different histopathology Lupus vulgaris is the form which causes destruction of nasal tissue The process usually begins in the skin of the face and extends to the nose, or more rarely it may be primary in the skin of the nasal vestibule

7 Deviation of the nasal septum is said to be rare in the fetus and in the newborn infant When present, there is evidence that it may be a result of hereditary defect in the germplasm Since the growth of the nose is not completed until after puberty plastic operation should rarely be undertaken before that time As in all general rules it may be disregarded if a condition demands immediate earlier relief as may be the case if septal deviation is obstructive.

8 Congenital growths about the nose are not common neither are they very rare Those most frequently reported are fibromas, mucodermoid cysts and teratoid tumors These last are not true teratomas which are said to be exceedingly rare as congenital growths

9 The entire mobile portion of the nose may be enlarged to a deforming degree (potato nose) As is true of the other exaggerations of development of the nose operation should be delayed until maturity to avoid distortions of normal postnatal growth

ACQUIRED DEFORMITIES

Trauma The prominence of the nasal organ in its position on the face makes it an easy object of injury and this cause is the most frequent one of all deformities. Children at play are subject to frequent injury of the nose The seriousness of an injury may not be immediately apparent appearing only later with mature growth of the organ *Competitive sports* are a frequent source of severe injury to the nose The more serious injuries, and possibly the most frequent, are suffered in automobile and motor-cycle accidents Severe burns both by fire and by chemical agents also freezing are frequent causes of destruction and deformity of nasal tissue Less usual causes are retaliatory biting by both animals and humans

Infections. Congenital syphilis is often a cause of nasal deformity though its effect may not be evident at birth Acquired syphilis has been commonly a factor in destructive lesions of the nose Tertiary manifestations in the nose are the most common gummas being a frequent occurrence Gummas usually form in the bony septum and extend to the cartilage with necrosis and consequent loss of both bony and cartilaginous septum The present early treatment of syphilis should lessen the occurrence of this deformity

Infection by prosthetic material used in rhinoplasty may result in nasal distortion This is true also of other postoperative infections.



FIG 130 (*Left*) Nose in tertiary syphilis with loss of nasal bone (*Center*) Profile showing saddle deformity (*Right*) Lesion in palate with complete destruction of the bony and cartilaginous septum



Fig 129 Destructive tuberculous lesion of nose Right profile front and basal view

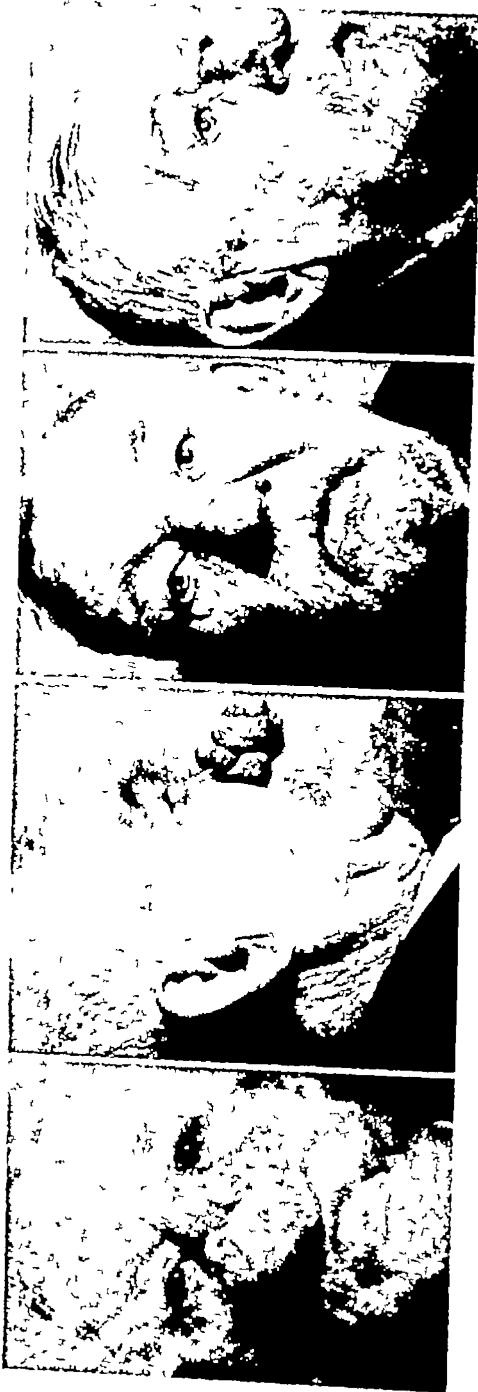


FIG 132 Large lobulated rhinophyma shown in front and in profile before and after operation (Grattan, J F Surg Gynec & Obst 42 101)



Fig 131 Rhinophyma. Showing front and profile views of the nose before and after operation (Grattan J F Surg Gynec. & Obst. 41 99)



FIG 134 Simple rhinophyma before operation (Thorek, Max The Face in Health and Disease, Philadelphia, Davis)

In general, it is said to affect those parts of the skin where there is least subcutaneous tissue The process is a slow, chronic one, and ulceration is a terminal manifestation Destruction of the soft parts of the tip of the nose, including the alae, may be more or less complete, leaving the lower extremity of the nasal cartilage largely denuded and giving the nose the pointed effect of a beak This is the condition which the plastic surgeon is called upon to repair

The differential diagnosis must rest on the histologic findings to distinguish this condition from tertiary syphilis, lupus erythematosus, mycosis fungoides and basal cell epithelioma. Lupus vulgaris



Fig 133 Large bi lobed rhinophyma shown in front and in profile before and after operation (Grattan J F Surg Gynec & Obst 41 102)



FIG 136 *(Left)* Ulcerated basal cell epithelioma of nasal dorsum *(Right)* After operation, in which the growth was excised, the surrounding skin undermined and the skin edges approximated and sutured

is described as a chronic skin tuberculosis which differs histologically from typical tuberculosis of the skin

Rhinophyma The condition of the external nose called rhinophyma has been ascribed to many different causal factors As the name itself signifies this condition is a benign tumorlike growth of the nose The skin is hypertrophic and is associated with lobulated masses containing enlarged pores filled with secretion

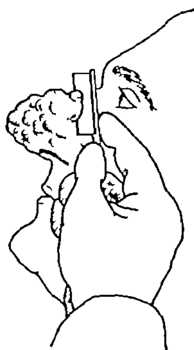


Fig 155 Rhinophyma The excess is shaved off (Wolf G D Ear Nose and Throat, Philadelphia Lippincott)

Treatment The nodular masses are pared down with a razor until the nose is properly shaped Pressure dressing is applied to control bleeding Skin-grafting may be necessary if epithelialization does not take place Dressings are maintained for several days

Glanders also may cause ulceration and necrosis of the nasal septum with resulting deformity

Variola as a cause of nasal defect has been reported by Joseph

Leprous destruction of the septal cartilage with saddle formation is rarely seen in routine nasal surgery but the possibility of its occurrence should not be overlooked.

tum until, in late extreme processes, the greater part of the external nose is destroyed.

Of the sarcomas, the round-celled type is the most common one in the nose The process usually begins in the posterior part and extends both forward and backward

Paraffinoma This is a chronic inflammatory condition involving the subcutaneous tissue and skin of the nose This was due to injection of paraffin in the early part of the present century by cosmeticians The injection of paraffin is to be condemned



Fig 138 Paraffinoma tumor removed (Wolf, G D Ear, Nose and Throat, Philadelphia, Lippincott)

Under local anesthesia this growth may be removed by an external route Intranasal methods have been successful when the paraffinoma was encapsulated

Angioma of the Nose. Angioma of the nose resembles rhinophyma However, it is characterized by a bulbous protrusion of the nose due to distended capillary vessels The tumor upon palpation reveals pulsation and warmth

Endocrine Disturbances Of these, acromegaly is perhaps the one most frequently seen in nasoplastic surgery Less frequent are the bone conditions, leontiasis ossea and osteitis deformans Defects of cartilage development are seen in achondroplasia Although this condition is classed as of endocrine origin, the exact cause is not determined It is, however, considered a result of disturbed metabolism The condition is also said to begin during fetal life and to result from anomalies of the germ plasm, in which case it should be classed as hereditary.

Neoplasms. Malignant disease as such is not the immediate concern of the plastic surgeon The histologic diagnosis is of little importance to him since repair is called for only after the destructive agent has been eliminated as is true also in other tissue-destructive processes

Many types of both benign and malignant new growth may appear in or about the nose though some of these conditions can



Fig 157 Paraffinoma of the nose Anteroposterior view *(Left)* Before operation. *(Right)* After operation. (Wolf G D Ear Nose and Throat Philadelphia Lippincott.)

be treated without plastic operation if there is not great destruction The commoner benign growths include nevus teratoma rhinophyma angioma and papilloma The last is said to be very rare in the nose and more frequent in the nasal sinuses Lipoma of the nasal tip also occurs occasionally Of malignant tumors of the nose carcinomas make up 60 per cent sarcomas 30 per cent and endotheliomas 10 per cent Malignant growths of the nasal passages have been found not to give characteristic symptoms in the early curable stage For this reason they are often not diagnosed until they have caused tissue destruction.

Destructive malignant lesions developing from ulcerating late carcinomatous skin growths (epitheliomas) are not infrequent about the nose. Such malignant growths of the skin may not only invade the soft parts of the nose but extend to the nasal cartilages and sep-



Fig 140 Cavernous angioma of the nose (Lederer, F L Ear, Nose and Throat, Philadelphia, Davis)




Fig 139 Paraffinoma of the nose Lateral view (*Left*) Before operation (*Right*) After operation (Wolf G D Ear Nose and Throat Philadelphia Lippincott.)

PLASTIC REPAIR OF THE DEVIATED SEPTUM ASSOCIATED WITH A DEFLECTED TIP

Operative Procedure. By means of a rake retractor the ala of the nose on the side of convexity is elevated and the line of deviation of the septum (shelf buckle) located With a Bard Parker No 11 knife the mucosa is cut through and the connecting tissue between the upper and lower lateral cartilages is incised This incision is repeated on the opposite side

A straight pointed double-edged Joseph knife is introduced into the first incision and is carried to a point 1 to 2 mm above the caudal margin of the nasal bone in a plane immediately above the perichondrium of the upper lateral cartilage and underneath the skin Here the knife is swept from side to side undermining the skin over the dorsum of the nose and then the knife is withdrawn This procedure is repeated through the intercartilaginous incision on the right side

A button-end knife is then introduced through the first intercartilaginous incision and advanced to the nasofrontal suture the knife being kept close above the perichondrium of the upper lateral cartilage and passed under the periosteum of the nasal bone Then it is swept obliquely downward across the nasal dorsum until the tip

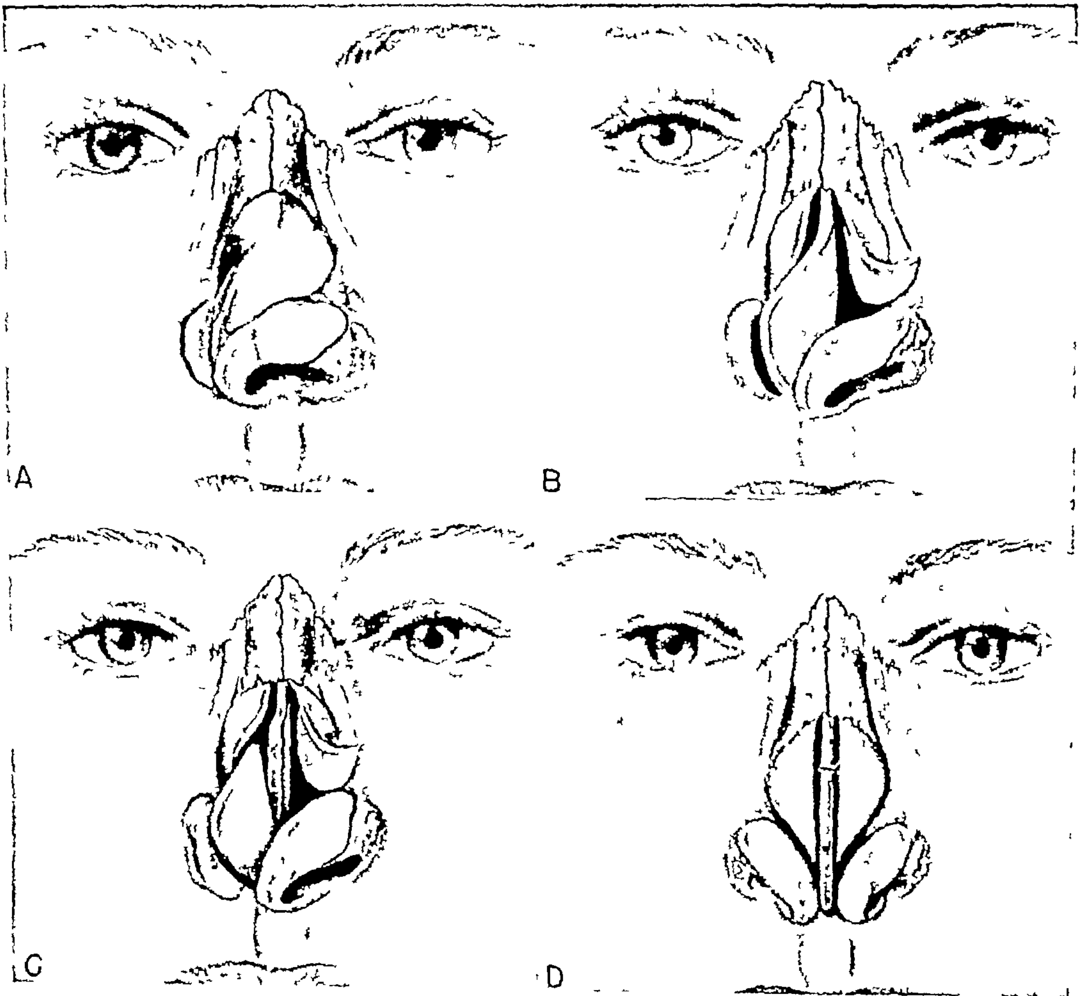


FIG 142 (A) Bony and cartilaginous structure of the deviated septum (B) Lateral cartilages separated from the deflected septum (C) Septal cartilage after removal of the narrow strip and the upper lateral cartilage as shaped to conform to that on the opposite side (D) Appearance of septal cartilage placed in midposition and sutured Seltzer Arch Otolaryng 40 433, 1944

of emphasis, since this tissue carries the blood supply which is necessary to the life of the cartilage itself

The narrow strip of cartilage between the two incisions is then removed by means of a goose neck (comma-shaped) hook By inserting this hook over the upper end of the narrow fragment of cartilage, with the aid of forceps the fragment can be stripped away entirely from the perichondrium of the opposite side, and the buckle of the cartilage adjacent to it is thus removed

After the removal of the strip of septal cartilage, the base of the septum is freed by making an anteroposterior incision along the

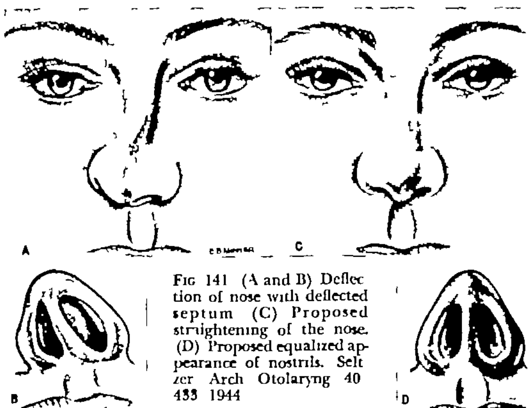


Fig 141 (A and B) Deflection of nose with deflected septum (C) Proposed straightening of the nose. (D) Proposed equalized appearance of nostrils. Seltzer Arch Otolaryng 40 433 1944

appears through the intercartilaginous incision in the opposite vestibule The nose is now transfixed and without change of the plane of the knife a cut to the caudal end of the septum is made then the knife is turned at a right angle and with the blade kept close to the caudal margin of the septal cartilage it is made to divide behind the columella through two thirds of the latter's extent (the membranous septum) The section through the membranous septum is completed with straight sharp-pointed scissors.

At this point the septum can be pushed to one side and into full view The operation on the septum itself is done by incising the mucoperichondrium on the convex side anterior to but near the line of deflection Through this incision the mucoperichondrium is elevated up to the buckle of the deflection With a Freer or a Ballenger knife an incision is made here dividing the septal cartilage completely from the dorsum to the base A second and parallel incision exactly similar to the first, is made 0 1 to 0.5 cm anterior to it In making these incisions through the cartilaginous septum particular care must be taken that the perichondrium and the mucosa on the opposite side are not cut. This point is worthy

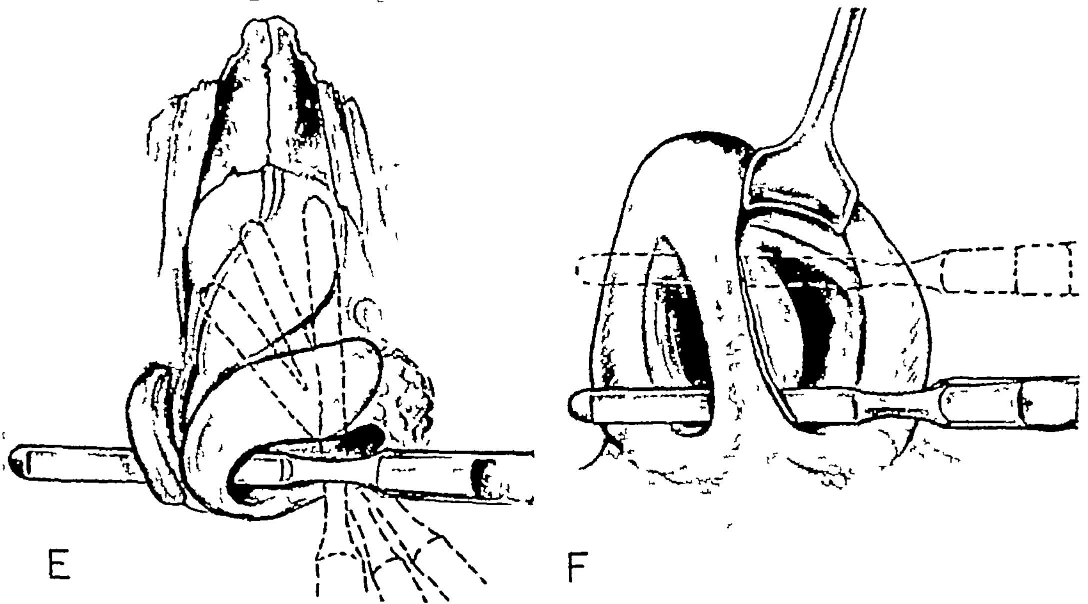


FIG 143 (E) Using the button-end knife in transfixing the nose (F) Cutting down behind the columella

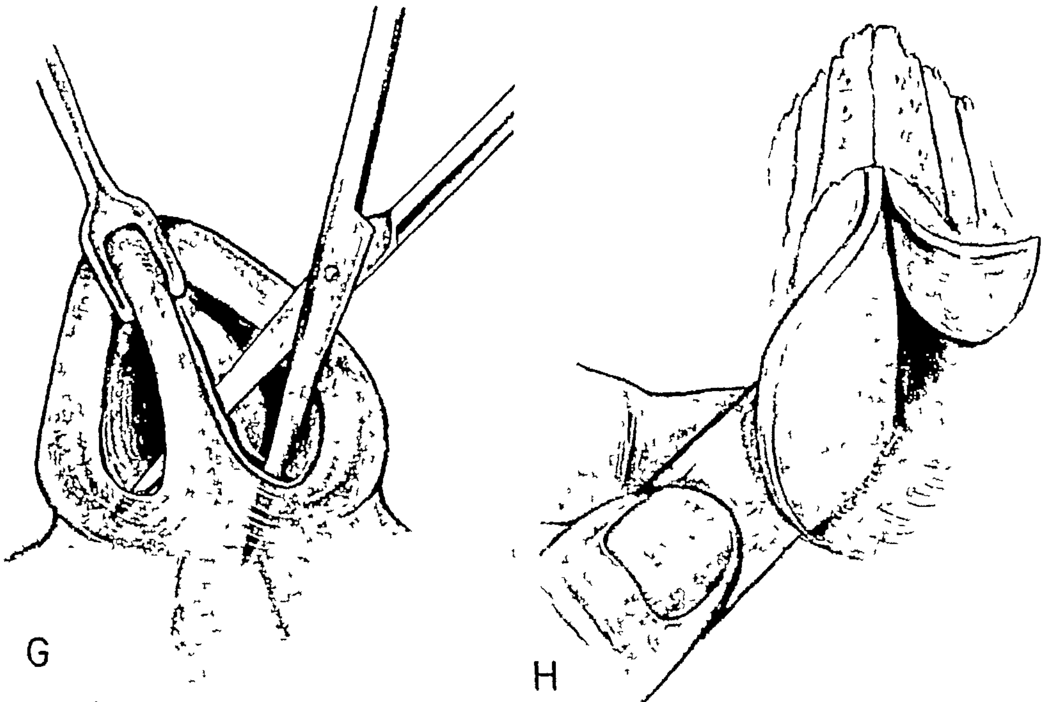
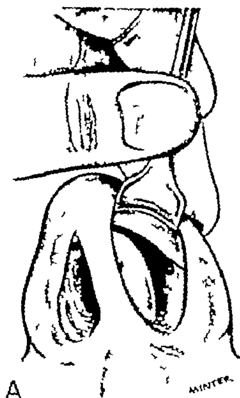


FIG 143 (G) Continuing the incision of (F) with scissors (H) Bringing the septal cartilage into full view



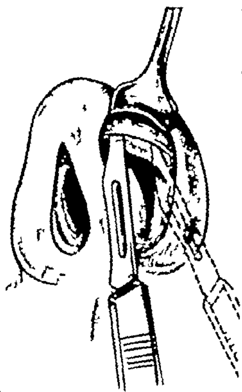
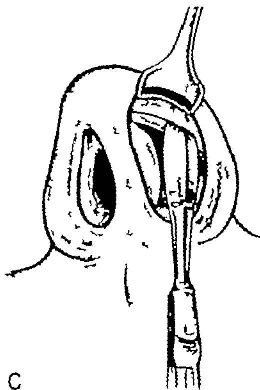


Fig 143 (A) Using the elevator to expose the deflected septum locate the nasal fold. (B) Making incision



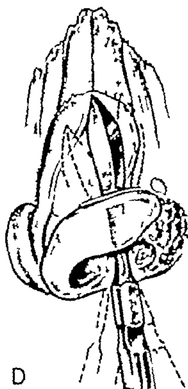


Fig 143 (C) Using Joseph's double-edged knife and retractor (D) Undermining the skin over the upper lateral cartilage.

DEFLECTED BONY BRIDGE A triangular piece of bone is removed from the frontal process of the superior maxilla on the broad side, and is then used as an inlay for the space created on the opposite side. (See Fig 151)

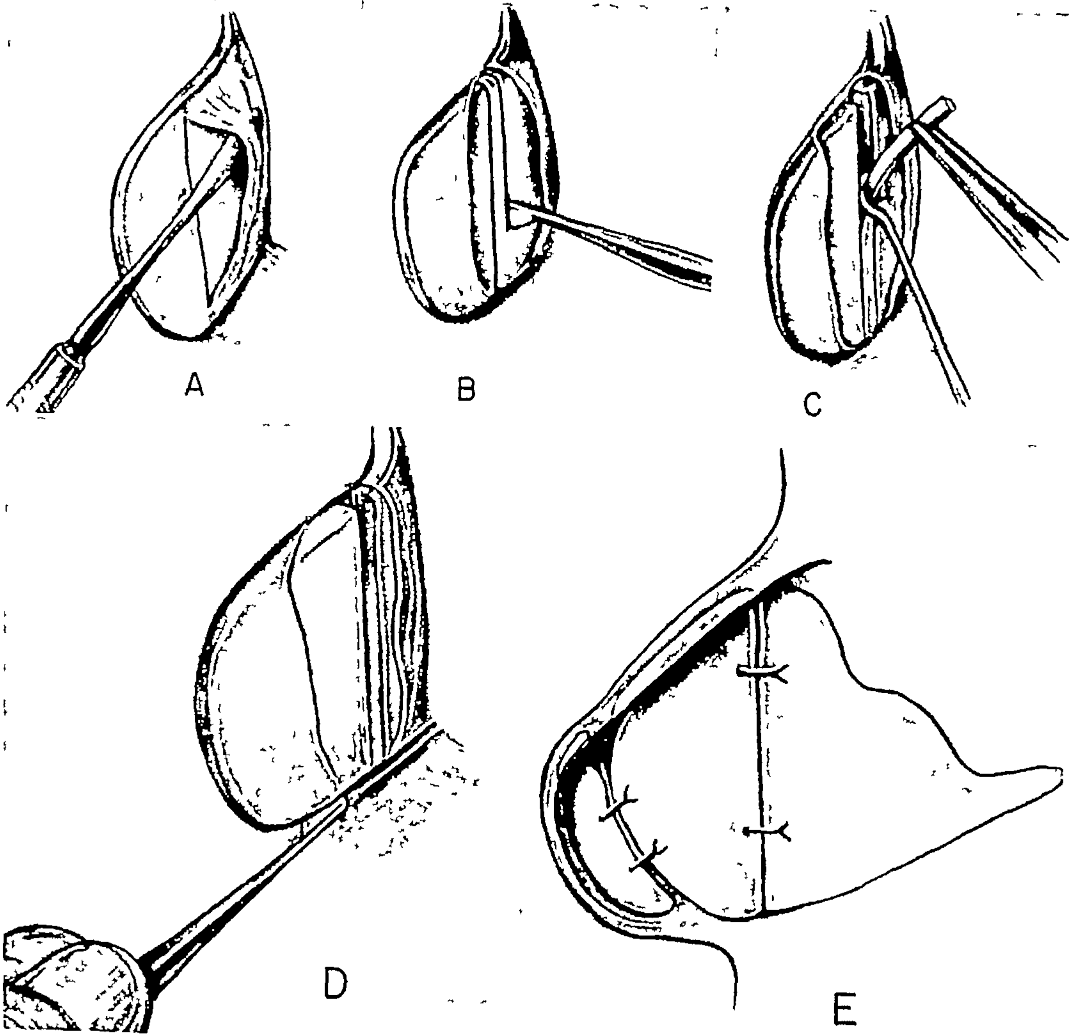


FIG 144 (A) Undermining the mucuperichondrium (B) Cutting a narrow strip from the septum (C) Removing the strip of cartilage with a gooseneck hook and forceps (D) Showing line of incision through the septal cartilage along the nasal floor (E) Showing sutures in place holding straightened septum in position. Seltzer Arch Otolaryng 40 433, 1944.

nasal floor through the cartilage on the operative side with a Freer or a Bard Parker knife Care must again be taken not to go through the underlying perichondrium

The anterior segment of the septal cartilage being free it is like a door without hinges and is so freely movable that it can be placed exactly in the central position The surfaces of the cartilages where the strip has been removed are approximated and held together by two sutures The front border of the anterior segment is then sutured to the columella

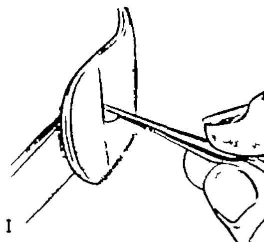


Fig 143 (I) Making incision in the mucoperichondrium with the Ballenger knife (Fig 143 A I Seltzer Arch Otolaryng 40 433 1944)

With the nose in the desired position an Asch tube wrapped in carbowax gauze, impregnated with 10 per cent sulfathiazole and 2 per cent kephrine hydrochloride is inserted into each nostril These tubes check bleeding afford bacteriostasis and provide drain age and ventilation They hold the septum firmly in position and give support to the reconstructed tip On the side of the former convexity a somewhat larger Asch tube is used than on the opposite side in order to secure pressure on the septum The tubes are left in place for from four to five days If desired they may be removed and reinserted after cleaning

An external adhesive dressing is finally applied or a stent mold may be used following the Aufricht method

DEFLECTED BONY BRIDGE A triangular piece of bone is removed from the frontal process of the superior maxilla on the broad side, and is then used as an inlay for the space created on the opposite side (See Fig 151.)

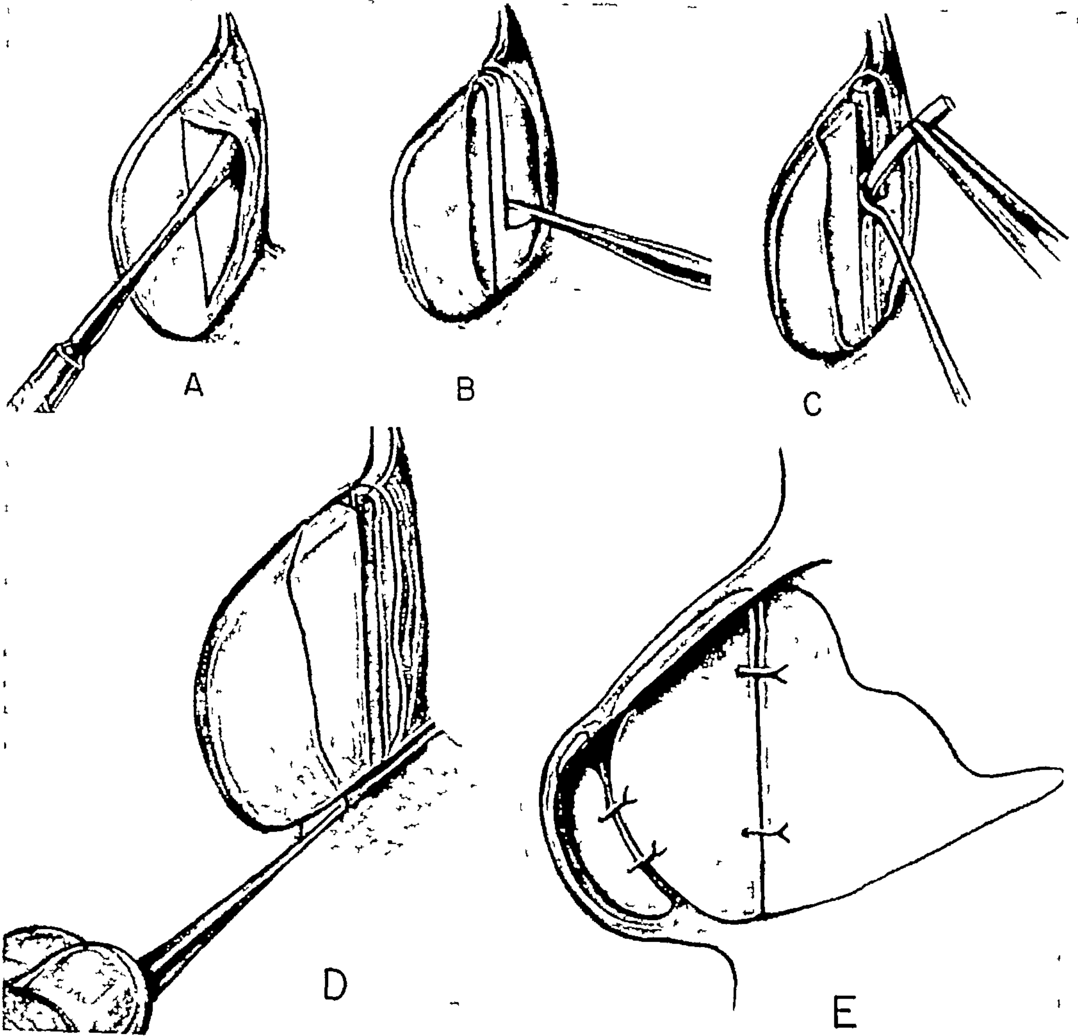


FIG 144 (A) Undermining the mucuperichondrium (B) Cutting a narrow strip from the septum (C) Removing the strip of cartilage with a gooseneck hook and forceps (D) Showing line of incision through the septal cartilage along the nasal floor (E) Showing sutures in place holding straightened septum in position. Seltzer Arch Otolaryng 40 433, 1944.

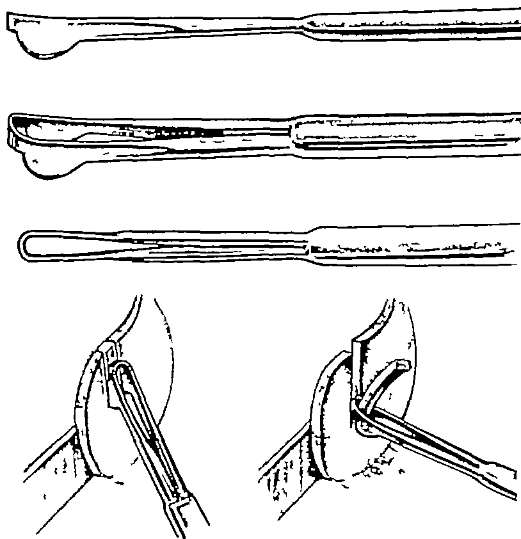


FIG. 145 Instrument designed by the author to be used for removal of a vertical strip of cartilage Particularly adapted for use with angulated septum



FIG 146 Deflected nose, corrected by removal of a triangular piece of bone from the right side of the nose



FIG 147 Deflected nose, triangle to be removed outlined with alcoholic mercurochrome or with gentian violet



FIG 148 Deflected nose shows position of the saw in removing triangle of bone

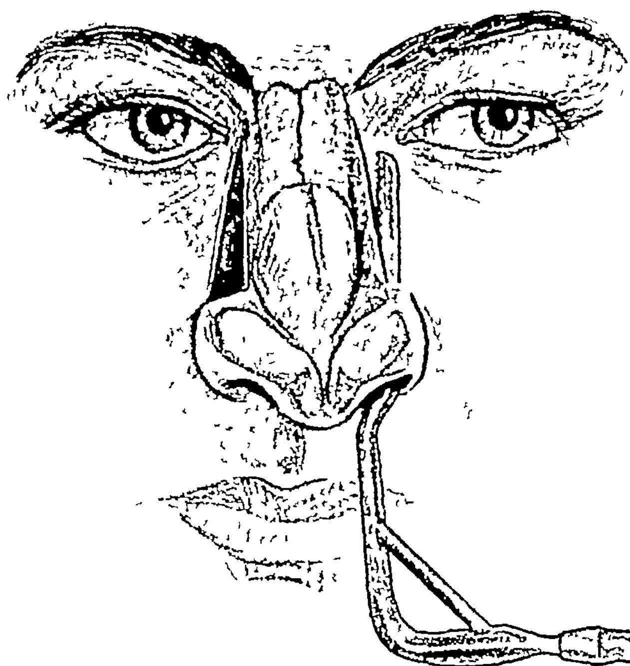


FIG 149. Deflected nose, position of saw in single line on left side to allow nose to be placed in the midline

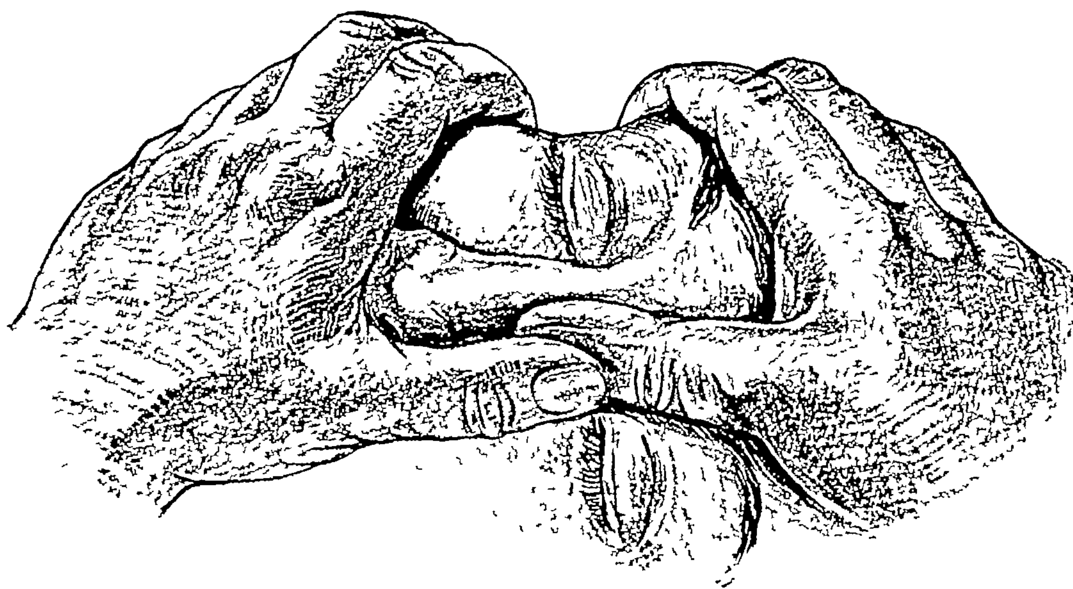


FIG 150 Deflected nose, refracturing the bones of the nose to push the entire bony bridge to the side, where the triangle was removed

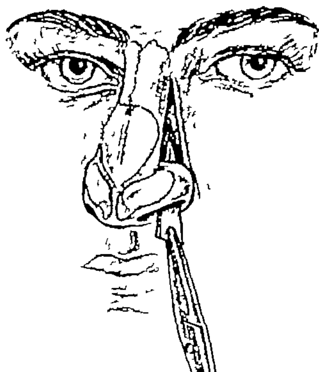


Fig 151 Deflected nose insertion of bone inlay after nose is placed in the midline



Fig 152. Deflected nose appearance after being repositioned by rhinoplasty



Fig 153 (*Left*) Deviation of nose with deflected septum (*Right*) After correction by removal of a triangle of bone from the right frontal process which was reflected to the left side



FIG 154 (*Left*) Deformity of nose by septum deflected to right. (*Right*) After surgical correction



Fig 155 Deflection of the nose caused by deflected nasal septum (*Left, top and bottom*) Nose before operation (*Right, top and bottom*) Nose after surgical correction



Fig 156 (*Left*) Deformity of nose from deflected septum hanging tip (*Right*) after correction



FIG 157 Right profile of preceding case (*Left*) Before operation (*Right*) After shortening nose and lengthening the upper lip



Fig 158 (*Left*) Concave deformity of right nasal bone from a blow (*Right*) After correction by elevation



FIG 159 *(Top, left)* Deformity of nose with deflected septum *(Top, right)* After correction of the deformity *(Bottom, left)* Shows tip of deflected septum in left nostril · *(Bottom, right)* Same view after surgical correction



Fig 160 Right profile of preceding case. (*Left*) Nose with slight hump. (*Right*) Hump removed and entire nose corrected to be in proportion to rest of face

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15

Restoration of the Subtotal and Total Loss of the External Nose

Joseph stated that total and subtotal rhinoplasty cannot be considered separately as far as their treatment is concerned that both require almost identical operative procedure

CAUSE

Except among war casualties the most frequent loss of tissue in the external nose is from occupational injury from accidents and burns Such loss may follow an unsuccessful primary operation on the nose in which ivory celluloid paraffin or other foreign substance has been used for reconstruction and has brought about local tissue destruction There are instances where infection has followed the removal of moles and malignant growths from the nasal dorsum or the tip In the colored race loss of nasal tissue often is a result of retaliative encounter with knives or razors

METHOD

There is obviously no one method which can be prescribed for rebuilding a gross defect of the external nose Each subject for this type of plastic surgery constitutes a separate problem The situations involved are quite different from those of general surgery —as an appendectomy for example where all the parts concerned in every uncomplicated case are entirely similar

Recognizing this diversity the question is resolved into one of adaptation of the fundamentals of anatomy and physiology which are not notably different now from what they were centuries ago The early method which originated in India of using pedicled

grafts from the forehead, and the sixteenth century method practiced in Italy, of taking skin grafts from the arm, are still employed in modern plastic surgery, only points of detail have been altered.

Carpue (1814) in England used the Indian method of grafting from the forehead, Graefe (1816) transplanted grafts from the inner surface of the upper arm according to the Italian custom. Dieffenbach (1845) also used grafts from the forehead. Nelaton and Ombredanne (1861) employed the indirect method of skin grafting from the chest to the wrist to the nose. Rosenstein (1913) also used the indirect method but transplanted from the chest to the submental region to the nose. These were all pedicled grafts.

In India free grafts had also been used from the gluteal region. As a matter of physiology, it is of interest to mention that they beat the area to be transplanted for some time with a leather strap, in order to enhance its viability apparently by increasing the local blood supply.

Grafts from nearly all skin surfaces of the human body have at some time been used in rhinoplasty.

DIAGNOSIS

When it has been determined that the patient is in a suitable physical condition it is of special importance that the field for operation be given a painstaking examination, since this is actually the most significant step in the entire procedure. It should be determined as exactly as possible how much tissue still remains in and about the field that can be utilized in the restoration. An estimate should also be made of the extent of the new surface that must be covered. This should allow not only for the missing parts but for the scar tissue which is present and which must be removed.

The size of the graft should be sufficient also to allow for possible retraction of the edges surrounding the excised scar tissue. Too much can be dealt with more easily than too little.

The next decision should be from what skin surface a suitable graft can be secured. Not only must such an area be of adequate extent but it must not contrast too greatly with the skin of the field where it is to be applied.

Not only should the texture of the skin flap match that of the field

of operation as nearly as possible but the amount of subcutaneous fat should also be considered This is particularly important in grafts for the nose It is also well to remember that skin overlying much fat has relatively a less blood supply than elsewhere But too little fat can be as undesirable as too much

PREOPERATIVE MEASURES

Preoperative measures should be carried out as already described A cast of the face is desirable On this the intended reconstruction can be modeled and all operative details determined completely before making an incision

OPERATION

Since there is no single operation that is suitable in all cases of nasal reconstruction Joseph s technic is outlined here He preferred to use a pedicled flap from the arm since the method avoids the resulting scar which follows a forehead flap

1 All scar tissue is first excised If there is still normal skin present over the root of the nose an inverted U shaped incision is made, beginning at one side of the nose passing upward and over the upper root, then down the opposite side The skin within this area is undermined and turned downward with the epithelial surface downward to serve as a lining for the nose If there is not sufficient normal skin about the upper nose to serve for lining small skin flaps from the cheeks or from the forehead can be lifted and rotated into position

In preparing for a skin flap from the left arm this incision about the nose area is carried farther downward on the left side to about the lower border of the ala that on the right side of the nose should reach only about the upper alar sulcus. This is done to increase the width of the nutritive skin bridge.

2 If the nasal bones are prominent they are removed to make a surface which will facilitate the construction of a suitable dorsal contour when a bone graft is inserted and one that will not be too high in its upper extremity

3 The left arm is the more suitable source of a graft, since it leaves the right arm free The arm graft may be taken either from

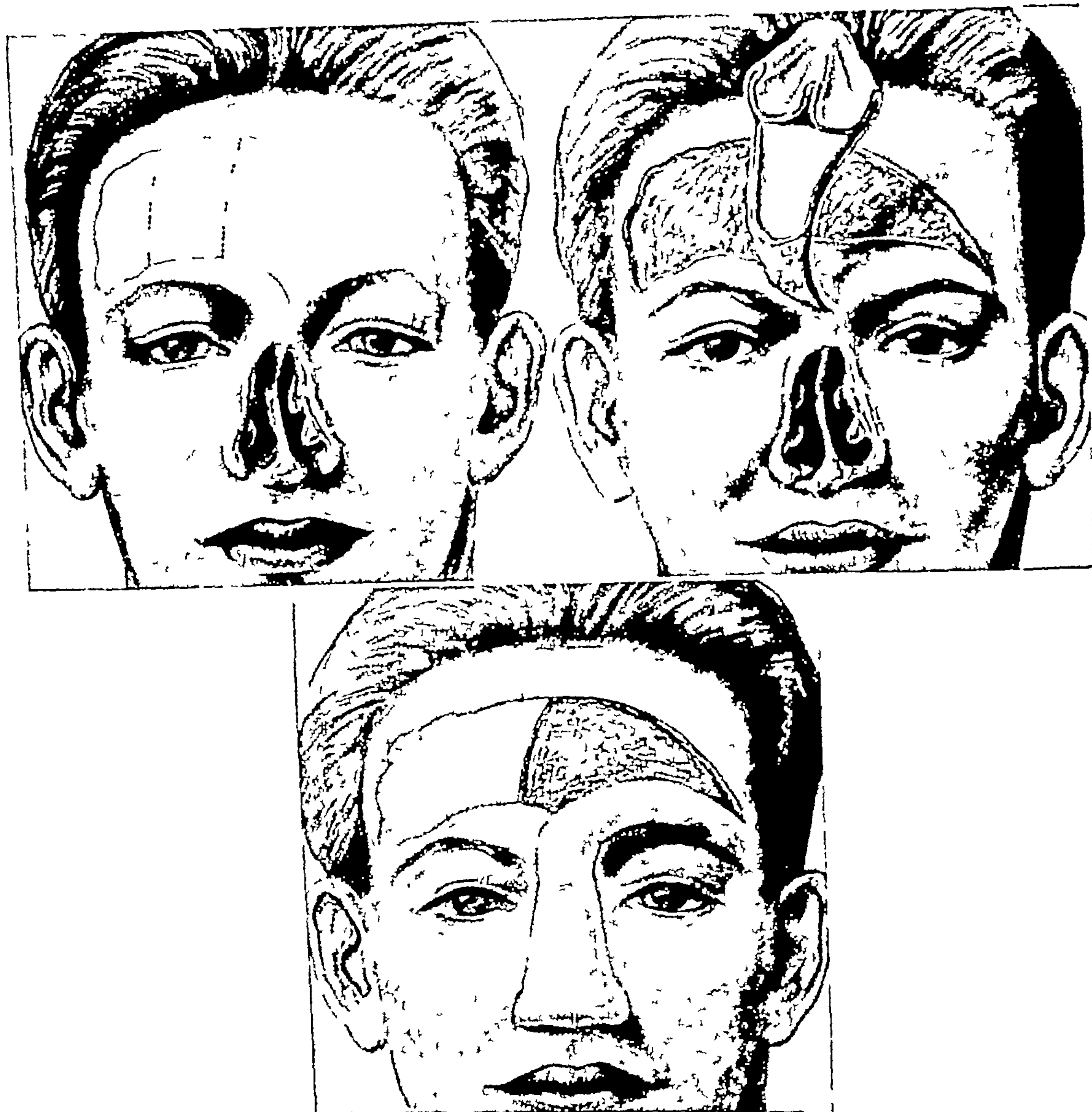


FIG 161 *(Top, left)* Total loss of nose, forehead flap is outlined and prepared Section between two dotted lines is to be lined, unless local flaps from nasal region can be turned inward *(Top, right)* Flap is mobilized, lower end is folded in such fashion as to provide lining for lower portion of nose and columella *(Bottom)* Flap is transplanted, secondary defect at forehead is covered with full-thickness skin graft (May, Hans Reconstructive and Reparative Surgery, Philadelphia, Davis)

the upper or the lower arm Various outlines for the incision have been used Some provide small extensions to serve as columella and alae. Joseph preferred a roughly angulated figure 6 on the inner surface of the upper arm as it falls at the side When this flap is dissected free, it can be applied easily over the prepared nasal field and sutured in place This is a pedicled graft.

The measurements for this flap should be determined very carefully before the incision is made so that the extent of each shall correspond closely Unless the operator has a particularly accurate eye for distances a measuring unit should be employed If a cast of the face has been made and a restoration modeled upon it, an exact pattern can be cut from which the flap can be outlined upon the skin of the arm

The position of the proposed flap should be determined accurately in a manner to secure suitable vascular supply through the pedicle Severing larger veins should be avoided but, if cut they should be tied off *These steps are of importance in helping to* avoid necrosis and gangrene of the skin

If the denuded area on the arm is very extensive the margins should be drawn together as much as possible and sutured after the skin flap has been elevated and transplanted upon the nasal field. The replacement with free grafts may be necessary

4 Joseph used a starch bandage to immobilize the arm and the head. The operative field is covered by a small gauze and cotton pad, held in place by adhesive strips and safety pins. If the lower arm is at first included in the head bandage it should remain so only until the bandage is thoroughly dry It can then be freed by cutting off the necessary parts of the dry bandage The drying of this dressing can be hastened by using a head support made with loosely woven straps which raise the head from the pillow In applying this fixation bandage special care must be taken to avoid all pressure on the pedicle of the skin flap

When the transplant has become healed and the pedicle has been cut through the arm is lowered and immobilized in a sling Joseph advised giving the patient about 1/4 gr morphine half an hour before lowering the arm as this change in position may be extremely painful A state of shock has been reported as resulting from it



FIG 162 Total loss of nose Reconstruction with arm flap Flap has been raised in stages from median surface of upper arm, donor area skin-grafted Arm is moved to face, and free end of flap is sutured to defect edges Arm is held in position with plaster cast Flap is to be severed from its base after two weeks and its free end folded and sutured, as demonstrated in Fig 161, top right (May, Hans Reconstructive and Reparative Surgery, Philadelphia, Davis)

5 In following this method the left ala can be formed by the flap but the right is not. This lack can be met by elevating a small flap from the right nasofacial area where the wall of the nose normally arises and turning it medialward where it is sutured in place to the main skin transplant. This secondary operation should be done after the primary wounds are entirely healed Other operators using a different outline for the transplant have been able to draw a design which makes this secondary operation on the right ala unnecessary

6 When the soft parts of the reconstructed nose are completely healed the supporting framework is introduced The advantage in this delay in introducing the framework of the new nose is that (a) there is less danger of necrosis after the skin flap has healed and that (b) the midline of the nasal reconstruction can be exactly determined for insertion of the supporting material

Details for preparing and introducing the bone graft have been fully presented in another chapter

7 Postoperative modeling may be needed (a) to improve the contour of the nasal tip (b) to make the entire nose smaller (c) to enlarge the nares or alter their position (d) to change the shape of the alae

A method using a forehead flap has many adherents some of these recommend that this method be used always when possible that flaps from the arm and the chest be used only when necessary

Fomon gives the details of this delayed flap operation with the end in view of (a) restoring the respiratory passages and (b) restoring the nasal lining As already specified this end should be reached by using adjacent tissue if possible If needed skin from the labiofacial folds may be utilized or free grafts can be placed on the under surface of the skin flap before it is transplanted A split skin graft, wrapped round a stent mold can be placed under the forehead flap, which is then sutured back into place and left for ten days. At the end of this time the under surface of the flap and the underlying surface of the defect on the forehead should have become covered with a newly formed layer of epithelium When this flap from the forehead is re-elevated rotated and placed over the nasal defect its lower border should be shaped by suitable folds to represent the columella and the alae. The portion which is to form a columella

is first sutured to the upper border of the philtrum, then horsehair interrupted sutures are used to secure the graft on each side in the alar region.

A suitable dressing is applied, care being taken that there is no pressure on the pedicle of the graft. The sutures may be removed on the sixth day. After from 3 to 4 weeks, the pedicle of the flap is divided, precautions being taken that a sufficient portion is allowed for the distal side to ensure complete cover for the nasal area. The remaining end of the pedicle is replaced upon the denuded area of the forehead.

After a further period of three weeks, an angled cartilage transplant is introduced through a midline incision in the columella, as described in another section.

A method for reconstructing the nasal framework described by Gillies is to embed a rod of cartilage of the required length beneath the periosteum, under the delayed forehead flap, so that the periosteum partially surrounds it. After a period of five months, the flap, which is so designed as to form a columella and alae, is turned downward upon the nasal area of the face and sutured in place.

FACIAL PROSTHESIS

If a reconstructive operation is not advisable in gross defects of nasal tissues, whether because of the patient's general condition or on account of age, and in instances of excessive tissue loss or the possibility of recurrence of a malignant process, the prosthetic method should be substituted. In some cases a combination of plastic surgery and prosthesis may give very satisfying results.

As in plastic surgery, each case must be considered from the standpoint of its individual requirements. The attitude of the patient, his friends and his family are all important factors in the success of preparing and wearing the prosthesis.

Bulbullian gives three outstanding requirements in facial restoration by means of a prosthesis. (1) Its appearance must be natural, (2) its placing in position must be easy and it must be held there with comfort and security, (3) it must possess durability, be colorfast and easily cleansed.

In general, the requirements of the face prosthesis is that it be both esthetic and functional. It should also be borne in mind that

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The wax pattern is modeled on the cast, and after all corrections and adjustments have been made on the wax pattern, it is placed on the cast of the deformity and fixed in place by means of a hot spatula When all final details of form and line are satisfactorily completed and the wax pattern is securely attached to the cast, a separating medium is applied to the exposed surfaces of the cast, and the nostrils are completely filled with plaster The final mold can now be prepared

The Final Mold. All parts of the cast and of the wax prostheses are first covered by a layer of hard dental plaster of paris, applied with a camel's-hair brush to ensure complete coverage Liquid plaster is then used to fill in up to the top of a retaining wall, which should be at least ½ inch higher than the highest part of the wax pattern Hardening of the completed mold is allowed to take place undisturbed before the two parts are separated and the wax pattern is removed It is very important to make sure that all the wax is removed To separate the parts, the entire plaster can be put into cold water, which is then brought to the boiling point, and then allowed to stand for from 2 to 3 minutes, depending on the thickness of the mold The wax pattern can then be dislodged by means of a blunt wooden modeling tool If any of the wax melts into the plaster, it should be removed by placing the mold in boiling water for from 5 to 10 minutes and then washing thoroughly with a good wax solvent Even this treatment alters the fine surface of the mold and should be avoided if possible

The next step is to make a hole in the mold, through which the latex can be poured This should be preferably at the site of the nasal cavity, which was filled with cotton while the impression was being taken This hole should be funnel-shaped, with its greater diameter on the outer mold surface The inner end should be about 8 mm and the outer at least 3 8 cm in diameter This arrangement allows for a reservoir of latex to make up for shrinkage as the latex within the mold dries

Drying. A mold of this size should be dried in a drying oven at from 60 to 70 degrees for 24 hours

Casting. The mold, when dry, is ready to be used for the prevulcanized latex prosthesis This material should have been carefully compounded so that its color and translucence will harmonize with those of the skin of the patient

this method of repair may be only a bridge between injury and a later plastic operation In such instance, the work can be carried out as soon as healing permits a good impression to be made.

Preliminary Requisite. If the prosthesis is to be permanent, the tissues of the wound should first be firmly healed If however there is need for a more immediate restoration a temporary fitting can be done and a permanent one made later

The material (1) should be compatible with the tissues with which it comes in contact (2) to avoid irritation should be as pliable as the body tissues (3) must be light in weight so that it will stay easily in place (4) should have lifelike translucence (5) should lend itself easily to modeling or casting (6) must have suitable thermal conductivity (7) should be uninfluenced by sunlight heat, cold or moisture and resist deterioration (8) should lend itself to easy reduplication in case of loss or injury (9) must be inexpensive and easily procurable (10) should be easy to cleanse.

At present there does not appear to be any one substance which freely answers all the ideal requirements There are two main classifications of materials (1) Rigid and (2) flexible. Under the first class are metals and metal alloys vulcanite plastics wax and wax compounds Among the flexible materials are rubber gelatin-glycerin prevulcanized latex and plasticized plastics

Operating Requirements. A dental tilt back chair similar to that of the rhinologist is used. The supplies needed are (1) a sterilizer (2) two sizes of rubber bowls for mixing plaster of paris (3) sterile cotton (4) tongue depressors (5) sterile gauze (6) dental forceps (7) plaster spatula (8) petrolatum (9) several sizes of camel s hair brushes (10) impression material (11) boiler for melting impression material (12) mixing instrument (13) plaster both quick-setting and liquid (4) liquid soap (15) refuse receptacle (16) hand mirror

The articles to be used in the immediate preparation of the impression should be arranged on a table within easy reach of the operator

The prosthetic laboratory should be so arranged that each step of the technic has its special needs segregated in a separated section with provision for each

The cast is made in the same manner as that already described for rhinoplasty

The wax pattern is modeled on the cast, and after all corrections and adjustments have been made on the wax pattern, it is placed on the cast of the deformity and fixed in place by means of a hot spatula. When all final details of form and line are satisfactorily completed and the wax pattern is securely attached to the cast, a separating medium is applied to the exposed surfaces of the cast, and the nostrils are completely filled with plaster. The final mold can now be prepared.

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Drying. A mold of this size should be dried in a drying oven at from 60 to 70 degrees for 24 hours.

Casting. The mold, when dry, is ready to be used for the prevulcanized latex prosthesis. This material should have been carefully compounded so that its color and translucence will harmonize with those of the skin of the patient.

Pouring An amount of prepared latex sufficient for the size of the prosthesis is poured into the mold through the funnel-shaped opening and the mold is then put into a thermostat at about 70 degrees C. for roughly 45 minutes when it is removed and inverted so that the uncongealed latex will drain out. This will leave the inside of the mold lined with a partly hardened layer of latex about 3 mm in depth This latex layer when completely cured, represents the wall of the hollow prosthetic nose. To effect this final step the mold is returned to the thermostat, with its funnel-shaped opening downward, where it should remain for at least 12 hours.

Opening the Mold. On separation of the two parts of the mold the latex prosthesis will most often remain in the part where it was cast In removing it from the mold, particular care must be taken that small extensions of the mold into the nostrils do not cause breakage

Trimming There may be excess latex on the prosthesis caused by passage of the liquid through the joints of the mold This excess should be carefully removed with scissors to correspond to the original edge of the wax pattern The inner surface of the prosthesis also will need trimming where it is to come in contact with the facial surface when attached. The ends of the small pockets corresponding to the nostrils should be cut off to make open nasal passages.

Final Restoration. A perfect result should not be anticipated from the first casting which should rather be considered a trial fitting Subsequent casts may be necessary to reach a final satisfactory attainment of color and shape As is true elsewhere in cosmetic repair much depends upon the esthetic judgment of the operator

Retention. When the restoration is completed it can be held in place by means of frame spectacles, with the aid of possibly remaining parts about the nose such as remnants of the alar cartilages or a shelf like prominence of the upper lip at its junction with the columella which will serve to steady the prosthesis. Liquid adhesives are also useful in conjunction with other means as specified above. Here as elsewhere it will be necessary for the operator to adapt his technic to the individual condition

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16

Surgery About the Nares

ABNORMALITIES OF THE COLUMELLA

The size and the shape of the nostrils depend primarily upon the formation of the columella and the alae

The columella is that part of the membranous septum which appears normally in the midline between the nares It is continuous below with the middle segment of the upper lip or philtrum and above with the tissues of the nasal tip It forms the medial wall of the anterior nasal opening

The alae are present on either side of the lower aspect of the nose where they form the lateral margins of the nostrils. They appear as somewhat fleshy roughly semicircular thickenings with the curve on their upper outline where there is a shallow nasofacial fold or furrow

Both columella and alae are normally held in position in large part by the lower lateral cartilages with which they are in close contact. The columella is in relation with the medial crura of these cartilages and the alae with the lateral crura. These cartilages have been called alar cartilages but the exact association between these parts has been the subject of difference of opinion which led to the statement (Joseph) that they are all independent parts and to the suggestion that they be called tip cartilages. This viewpoint may have the support of a theory not usually well-defined that the cartilages represent the primitive nasal placodes or nasal pits while the soft parts of the columella and the alae arise from the medial frontal process and the superior maxillary processes respectively

Distortions about the nares involving the columella often require plastic correction The conditions most often seen are

Abnormally long short or wide.

Retracted or indented.

Split.

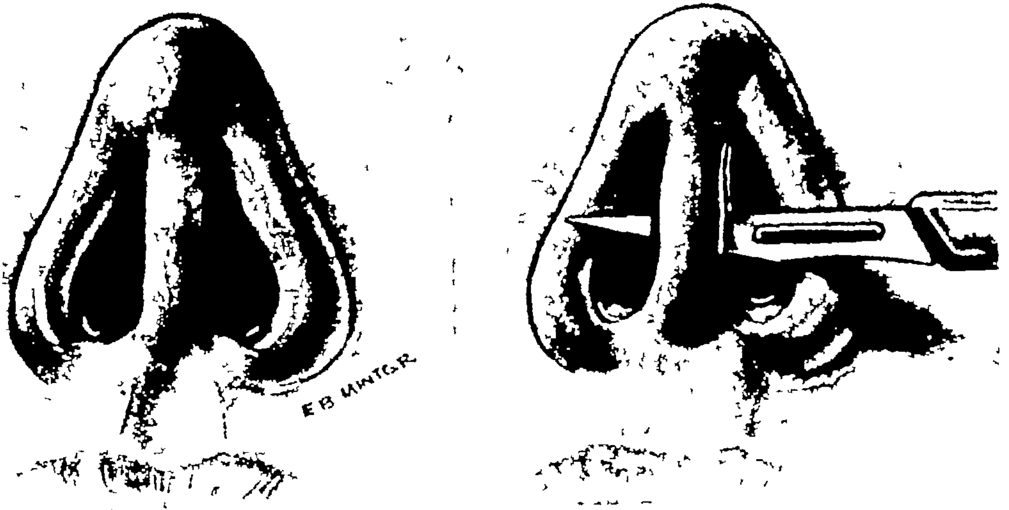


FIG 163 (*Left*) Too long columella to be shortened (*Right*) Bard-Parker No 11 passed through the mucocutaneous junction

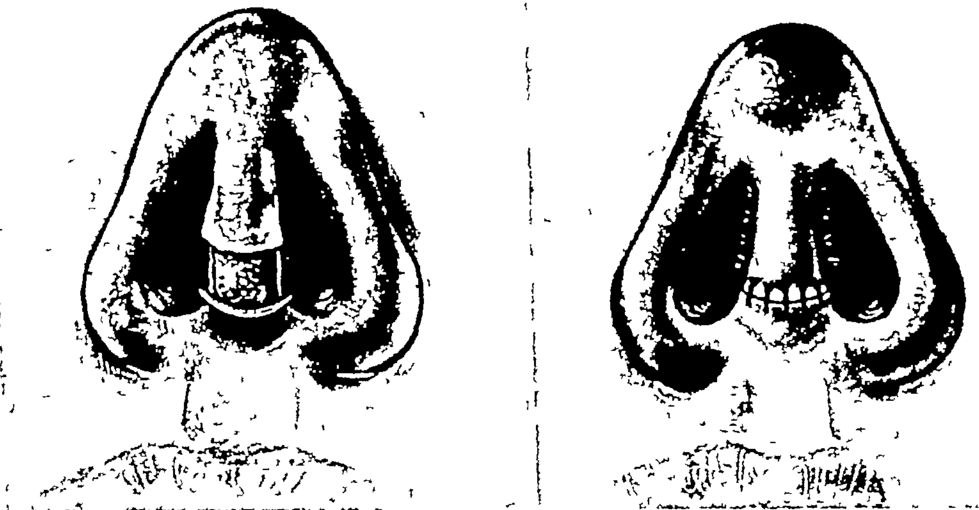


FIG 164 (*Left*) After excision of quadrangular area to shorten the columella (*Right*) Operation completed showing line of sutures

Oblique
Prominent or hanging
Partial or complete absence
Abnormally wide nasofacial angle

1. **Abnormally long columella** is associated with an unusual length of the nose as a rule, and both conditions should be corrected at the same time The operation consists of separating the columella from the lower border of the septal cartilage and from the

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Distortions about the nares involving the columella often require plastic correction The conditions most often seen are

Abnormally long, short or wide.

Retracted or indented.

Split.

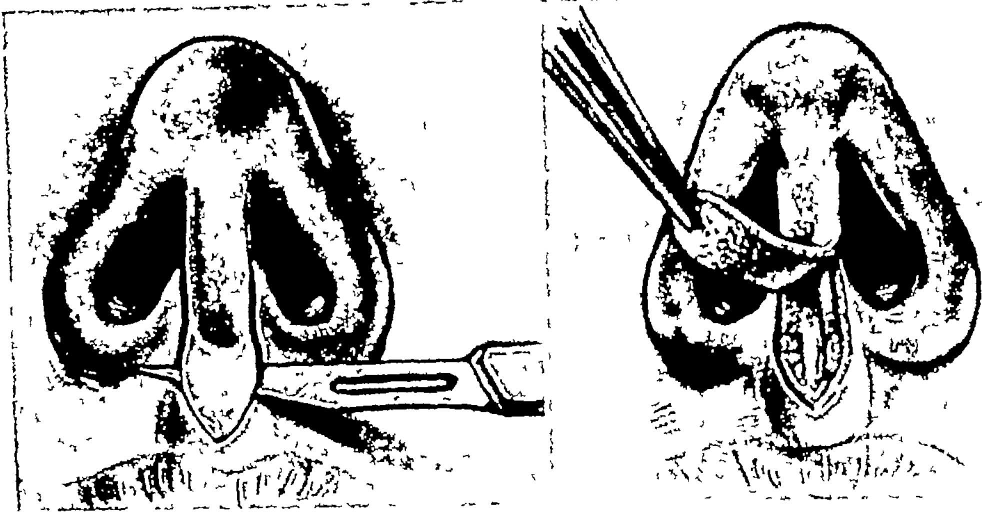


FIG 167 (*Left*) Bard-Parker No 11 shown undermining the skin (*Right*) Forceps elevate the incised skin flap

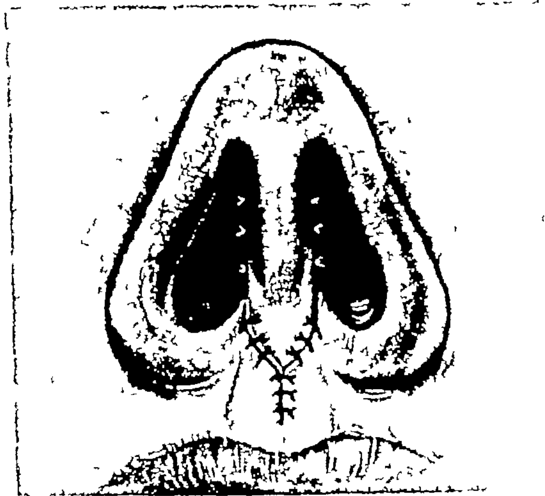


FIG 168 Operation for lengthening the columella completed, shows nylon 00000 sutures in place

V-shaped manner down the midline of the upper lip This flap is elevated and the tip of the nose is raised to the desired level, then sutured in place on each side, and the V-shaped incision is closed after undermining sufficiently and sutured

3 **Abnormal width of the columella** may be the result of an excess of soft parts or of an unusual degree of separation of the medial crura of the lower lateral cartilages

For narrowing the wide columella, the writer operates with an originally devised nasal tissue clamp This clamp may be made



Fig 165 *(Left)* Nose with too short columella *(Right)* Outline of incision for lengthening the columella

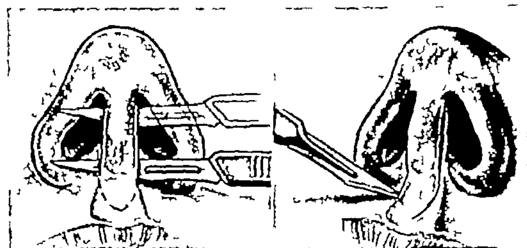


Fig 166 *(Left)* Knife (Bard Parker No 11) inserted through the mucocutaneous junction and carried downward. *(Right)* Tip of blade following the proposed line of excision downward to lengthen the columella.

philtrum excising the amount necessary to obtain the desired length and then suturing in position

2 The abnormally short columella is usually accompanied by a retracted or flat nasal tip which may be either congenital or acquired following accident or as a consequence of a previous operation on the nose If the shortening of the columella is a result of a fault in the septum the latter must be corrected but if the columella alone is involved an incision is made which extends the entire length on each side just within the vestibule and which is continued in a

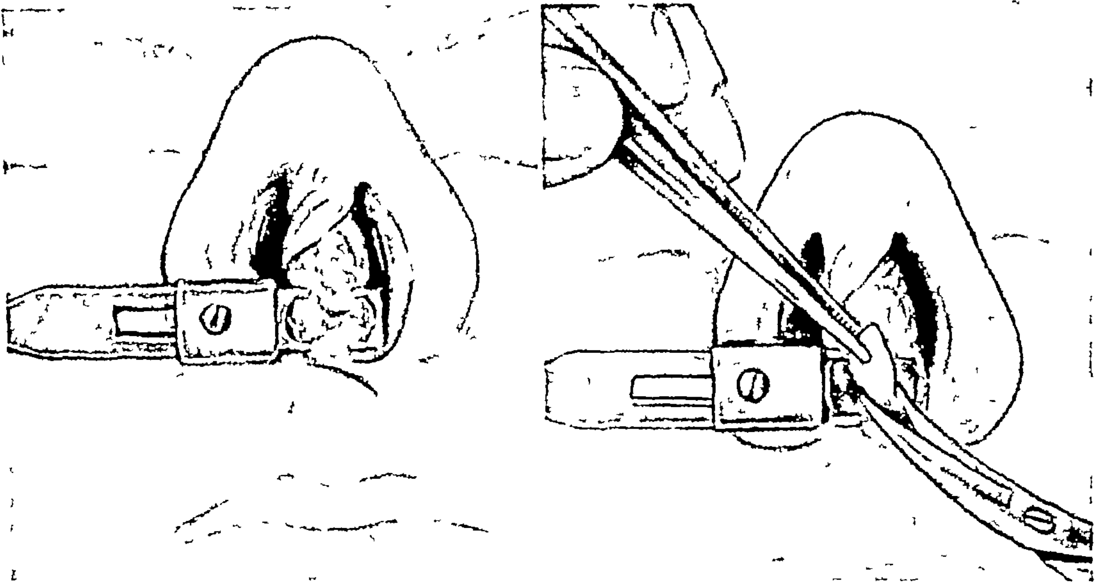


FIG 171 *(Left)* Instrument everting and presenting posterior surface *(Right)* Section of cartilage and subcutaneous tissue removed with scissors

of either stainless steel or chrome plate Its greatest length is 6⅜ inches (16 2 cm) The handle is the same as that of a heavy weight surgical knife At the distal end, which is ⅜ inches (1 0 cm) wide, there are small recurved prongs at either outer angle. Proximal to these prongs there is a sliding attachment of the same width with exactly similar prongs which are curved toward those on the tip of the instrument The sliding portion can be adjusted

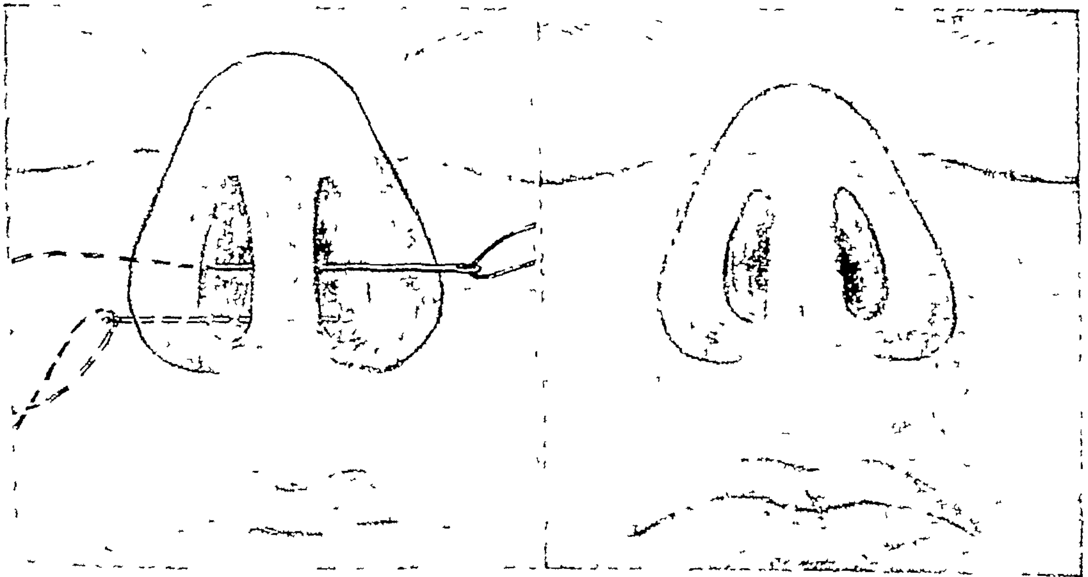


FIG 172 *(Left)* Two sutures inserted hold columella in narrowed position *(Right)* Wide columella reconstructed.

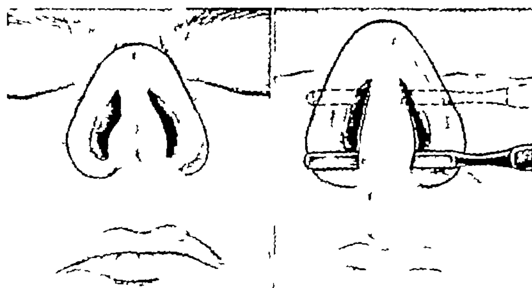


Fig 169 *(Left)* Nose with wide columella *(Right)* Button-end knife separating septum from columella

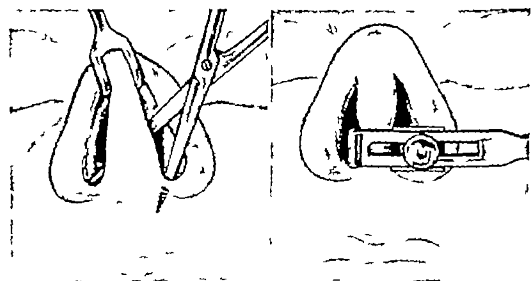


Fig. 170 *(Left)* Scissors separating base of columella *(Right)* Seltzer instrument applied to unequal and wide columella

posterior columellar surface and the lower border of the septum and at right angels to them, with the columella between the two pairs of curved prongs The clamp is adjusted and secured by fixation with the thumbscrew. With the tissue held in this way by the clamp, the handle is turned through a half circle, as with a lever, and the strip of tissue is everted. The excess of septal cartilage is removed and the desired amount of subcutaneous tissue and margins of the overlying skin of the columella are excised The clamp is withdrawn and the narrowed columella is sutured to the septal cartilage in a suitable position with either cotton or silk.

If the width is a result of too great distance between the tip cartilages, the tissue which separates them is excised and the cartilages approximated and sutured. Further steps are as given above

4 **A retracted or indented columella** presents a concave surface line and is usually a result of scar retraction following ulceration or of displacement of the septum (Fomon) With the former cause, lengthening may be necessary, with or without the addition of support The lengthening is done as outlined in Chapter 11. If added support is needed, it can be supplied by means of a small graft of cartilage taken from the ear, or elsewhere, and transplanted into a bed prepared for it in the columella

If the displaced septal cartilage causes the retraction, it should be freed from its attachments and returned to the midline (Metzenbaum).

5 **The split columella** is associated with cleft lip, which is considered in Chapter 17

6 **When the columella is in an oblique position,** it may or may not depend upon a deflection of the nasal septum If the position involves only the columella, the obliquity may be primarily at the base or at the tip In either case, the extremity concerned is freed and by a z-incision the columella is sutured in the midline

If the septum is deviated, it is completely freed as already described, and a strip of cartilage is excised through the entire height of the septum The two edges where the strip has been removed are approximated and kept in position by two sutures The anterior margin is then sutured to the columella Asch tubes wrapped in sulfathiazole-petrolatum gauze with 2 per cent kephrine hydrochloride are inserted within the nostrils to keep the parts firmly in position They also check bleeding, provide drainage and ventilation,



Fig 173 *(Left)* Wide columella. *(Right)* Reduced by Seltzer clamp

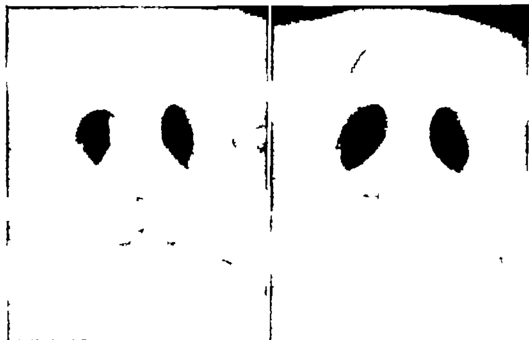


Fig 174 *(Left)* Base of nose with wide columella flattened tip, inequality of nostril and deflected septum. *(Right)* After correction by replacement of septum.

by means of a thumbscrew which allows an excursion of 3/4 inch (1 9 cm) This all metal clamp can be sterilized easily

The Operation A knife is passed through the columella at the junction of the surface skin near the nasal tip with the vestibular lining on one side to a similar opposite point and the incision is carried downward to separate the tissues from the lower border of the septal cartilage With scissors the lower portion is then freed from the anterior nasal spine by continuing the primary incision and undermining freely at the base of the columella At this point the clamp is passed through the incision so that it lies between the

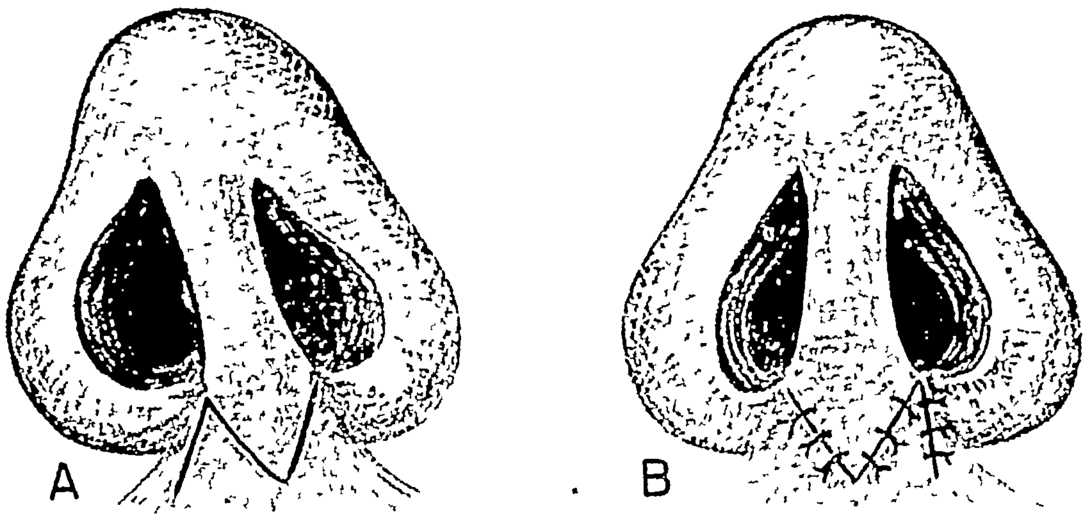


FIG 177 (A) Line of incision for correcting oblique columella
(B) Effect of corrective operation

If the length of the septal cartilage is at fault, it should be shortened, or a too long columella should be shortened Corrections for these conditions have already been considered.

If the width of the medial crura is the cause, the condition is most easily remedied by removing a curved full-thickness segment of the membranous septum.

8 **Partial or complete absence of the columella** may be treated by a variety of methods A satisfactory method is to use the middle segment of the lining of the upper lip as graft material This operation is done in three stages

STAGE 1 Evert the upper lip and make two parallel incisions on either side of the midline, leaving between them a strip of the width needed for restoration of the columella The incision should be carried down through the subcutaneous tissue. Undermine the strip at a depth of about $\frac{3}{16}$ inch (about 0 5 cm), forming a double-pedicle flap Underneath insert a thick split skin graft Suture the margins of the incisions and of the graft with interrupted horsehair stitches Trim off any excess of the graft and paint the suture line with compound tincture of benzoin Surround the area with a border of surgical glue and cover with a layer of thin rubber tissue A gauze pad is applied to the lip with adhesive tape, which is carried across each cheek to maintain firm pressure

STAGE 2 After two weeks, cut through the upper pedicle of the flap, evert the lip and fix it in this position with silver wire passed



FIG 175 (*Left*) Wide columella with slitlike nostrils (*Right*) After correction using Seltzer clamp

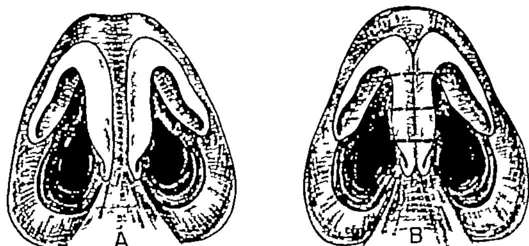


FIG 176 (A) Cleft nasal tip caused by wide separation of medial crura. (B) Cleft tip corrected by bringing crura together and suturing

and exert bacteriostasis The tube on the side of the former convexity is made somewhat larger in order to exert pressure (Seltzer) This dressing is left in place for from 4 to 5 days though the tubes may be removed temporarily and cleaned if desired.

7 A prominent or hanging columella presents a convex outline Its exact cause should be determined before correction is attempted. This condition may result if (a) the septal cartilage extends downward unusually (b) the columella itself is too long (c) there is undue width of the medial crura of the lower cartilages It may also be present in an unusually long nose

sure bandage is applied from cheek to cheek with adhesive tape to hold the parts in proper relationship

Another method for correcting the wide nasofacial angle is to make an intra-oral incision along the gingivolabial fold and remove the subcutaneous or bony spine by this route.

ABNORMALITIES OF THE ALAE

1 Unusual convexity of the alae is a characteristic of wide, horizontally directed nostrils and is dependent upon an increase in the curvature of the lateral crura of the tip cartilages

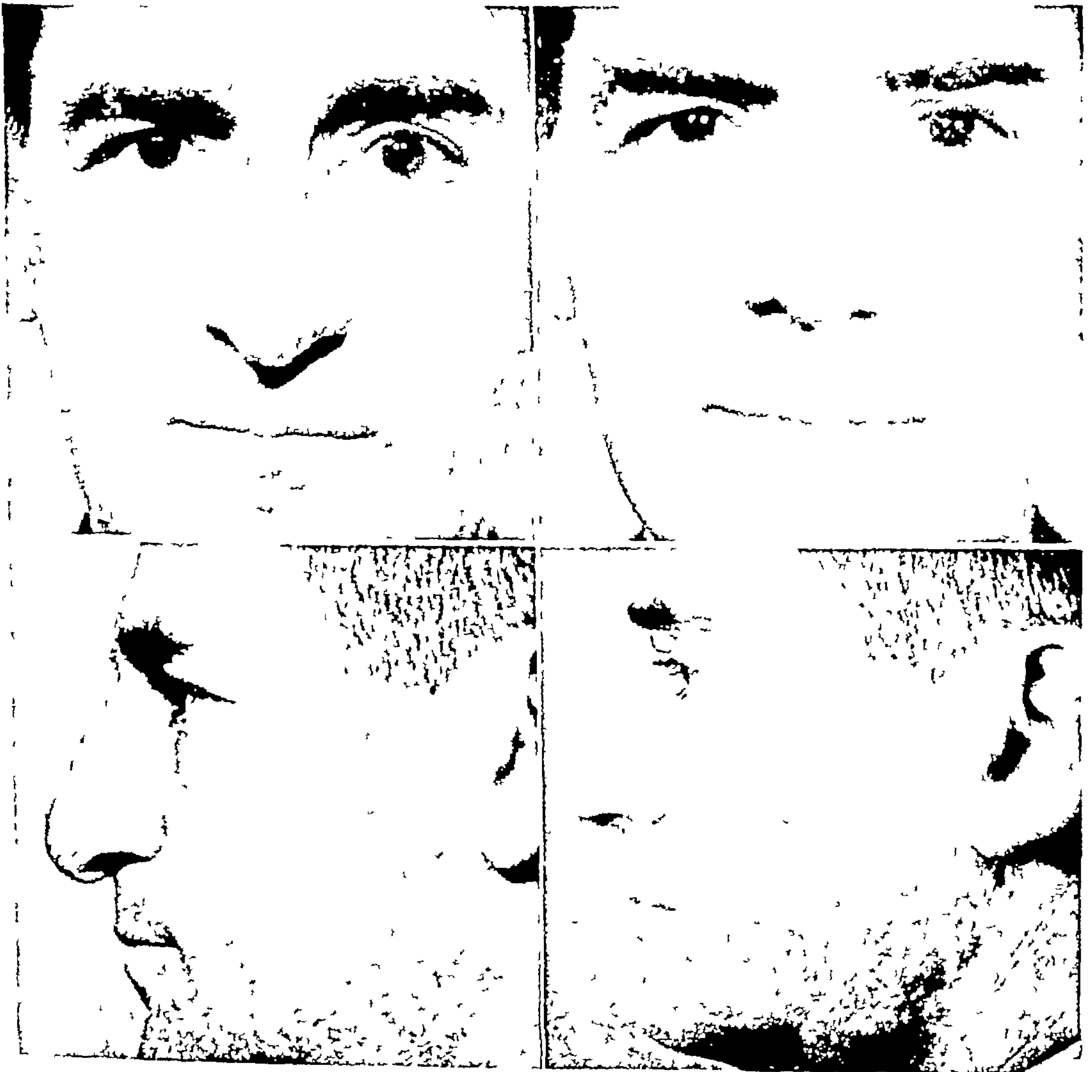


FIG 179 *(Top, left)* Long nose with hanging tip *(Top, right)* After correction, nose shortened *(Bottom, left)* Profile of nose before operation *(Bottom, right)* After excision of triangular piece of the cartilaginous septum Bone left intact at patient's request.

through a lead plate and fixed to the cheeks with strips of adhesive tape

Freshen the columellar stump at the nasal tip and join the constructed columella to it with interrupted horsehair sutures Undercut the surface layer bordering the defect on the lip and close with interrupted horsehair sutures.

STAGE 3 After three additional weeks incise the base of the flap make a small H shaped incision in the skin of the lip at the point of the normal columellar junction Free the included rectangular flap and suture of the base of the constructed columella Close the defect in the lip (National Research Council)

This method gives a satisfactory columella without visible scar and with least inconvenience to the patient

9 **The nasofacial angle** is usually about 90 degrees any considerable increase causes an unpleasant facial defect. This condition may be the result of an excess of subcutaneous tissue or of overgrowth of the anterior nasal spine or both these factors may be present.

Correction is done by separating the columella from its attachments to the septal cartilage and removing a sufficient amount of subcutaneous tissue if this is the only cause If indicated by its unusual prominence the anterior nasal spine is removed with a chisel The columella is then sutured in position and a firm pres-

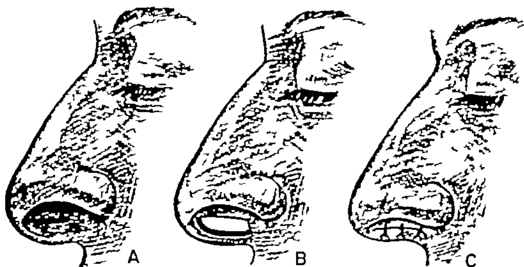


FIG 178 (A) Outline of proposed incision for reduction of hanging septum (B) After excision of septal tissue (C) Result of reducing operation

The convexity may be (a) near the facial surface or (b) nearer the nasal tip. If near the face, the ala is separated from the cheek along the alar-facial fold with scissors and a curved segment of the required dimension is excised through the entire thickness of the alar tissue Two or three horsehair sutures will serve to hold the skin surfaces in place (Joseph).

2 **Collapse of the alae** tends to close the anterior nasal openings and interferes with normal nasal respiration This variation in the normal alar curvature may be an individual characteristic; it may be due to underdevelopment or absence of the lateral crura of the tip cartilages or, on rare occasions, to paralysis of the nasal muscles.

To correct a concave alar curve, the lateral crura are exposed and freed intranasally, the angle of the cartilages cut through to allow the removal of the lateral crus, which is turned and replaced with the convexity outward.

If there is only a considerable deficiency in the development of the crura, an intranasal incision is made and a suitable pocket is prepared on each side for a small cartilage graft, which may be taken from the upper lateral cartilages, from the ear or other suitable source It must be made very thin, and the perichondrium should be left on the side toward the nasal cavity to maintain proper relations if there should be shrinkage (Fomon)

When the lateral crura are absent, a larger graft may be needed to correct the nasal condition For this operation, curved grafts are implanted in a bed which should extend from the lateral alar regions, round the anterior tip of the nostril and within the columella These larger grafts are easily prepared from rib cartilage They are sutured together along the midline (Barsky)

3 **An abnormally high curve** in the lower alar rim is usually a personal characteristic, if it is present on both sides. This condition is often present in an unusually long nose, and should be corrected by shortening the nose (Chap 11) If the nose is of average length, and the unusual curve of the rim is unilateral, it is ordinarily the result of scar-tissue contraction following injury.

This condition can be corrected by making an inverted V-incision, with one leg parallel to the line of the nasal dorsum; the other leg follows the nasolabial fold to a point just above the outer curve of the ala The incision is carried down to the perichondrium and the



FIG 180 *(Left)* Long nose with hump projecting anterior nasal spine causing small upper lip. *(Right)* Same profile after lengthening upper lip and correcting nasal contour correspondingly

cartilage, the rules of Langer's lines being observed. The skin is undermined on all sides and the margin of the nostril is then lowered to correspond to that of the opposite side, and held in place by a through and through mattress suture of very fine silkworm gut. The inverted V-incision has now become an inverted Y and the opposing edges are sutured with fine silk. The nostrils are loosely packed with gauze and a protective dressing is applied. The sutures are removed after from 3 to 4 days (Fomon).

4. **Low Alar Rim.** When the alar rim on both sides extends downward to an abnormal degree, the correction requires shortening of the nose. When it is present on only one side, a curved segment is excised from the entire thickness of the nasal walls along and just above the alar groove.

5. **Abnormally long alae** are usually present with a prominent tip and long nostrils. Correction is by a nose-shortening operation (Chap. 11). If they are extremely long, they can be shortened by making an incision through the ala at the facial fold and excising a narrow triangular segment based on the border of the nostril with the apex upward. The skin margins are sutured and the resulting scar is scarcely visible.

6. **Irregularity of the nasal rim** results from loss of tissue following accident or ulceration. Repair is easily done by a two-stage operation.

STAGE 1. Incise completely through the nasal wall, slightly below the level of the free margin of the nasal bone. From the anterior end of this incision, another is made parallel with the nasal dorsum, down to the edge of the present nasal rim. Lower the ala to the level of the one on the opposite side and suture in place, thus forming a new alar rim. The upper margin of the first incision is then sutured to the nasal lining.

STAGE 2. After an interval which depends upon the healing of the tissues, and when it is complete, a second operation is done in which a small triangular flap, the same size as the opening made by the first operation, and just above it, is turned down on a hinge formed by the upper margin where the skin and the nasal lining were sutured together. This flap furnishes the required nasal lining. A free skin graft from a suitable area of the same size is sutured over the flap just turned down. The nose is then packed with a pressure dressing (Barsky).



FIG 181 (*Left*) Prominent long nose projecting anterior nasal spine (*Right*) After surgical correction



Fig 183 *(Left)* Nose with wide, negroid type of nostrils *(Right)* Proposed sections to be removed for correction

7 Abnormally thick alae are caused by excess of soft or cartilaginous tissue, or a combination of them When soft tissues only are concerned, a simple method of correction is to make a curved incision into the lower surface of the alae and excise the necessary amount to produce the desired effect The margins of the incision are then drawn together and united with interrupted sutures

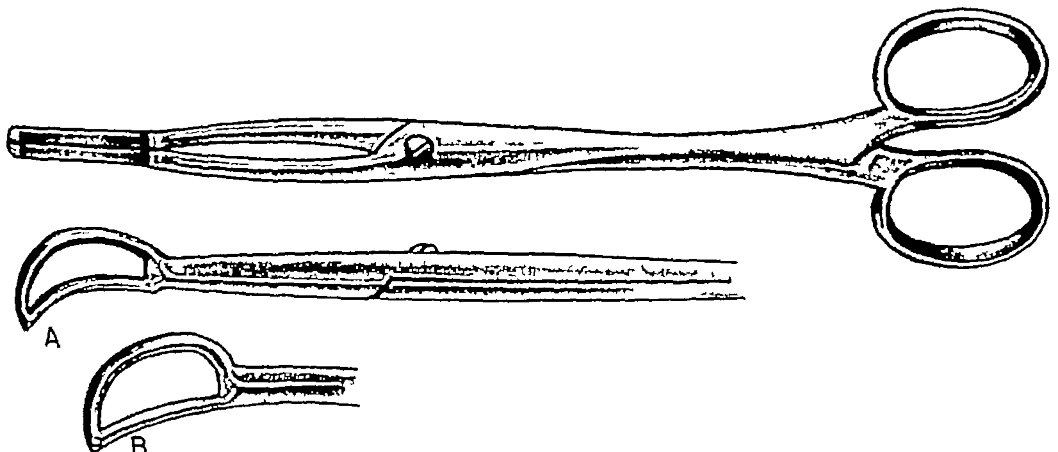


Fig 184 Instrument designed by the author for removing a wedge of tissue from the alae nasi Made in two sizes (A and B)



FIG 182. (*Left*) Long nose with slight hump and projecting tip (*Right*) After surgical shortening

8 Atresia of the nares involves both the columella and the alar rims This condition may on rare occasions be congenital, though it is usually caused by contraction of scar tissue after accident or infection

OPERATION. Incise around the nostril, starting at the base of the columella, to the nasal tip: then follow the normal curve of the ala. That part outside the incision now represents the free border of the new ala By sharp dissection into the nasal tissues, a pocket is prepared, exposing the medial crus of the tip cartilages, the superior ridge of the septum and lateral crus of the tip cartilages, the inferior ridge of the nasal process of the maxilla and the base of the maxillary pyriform opening This procedure permits the return to a normal position of the distorted parts There is overcorrection of

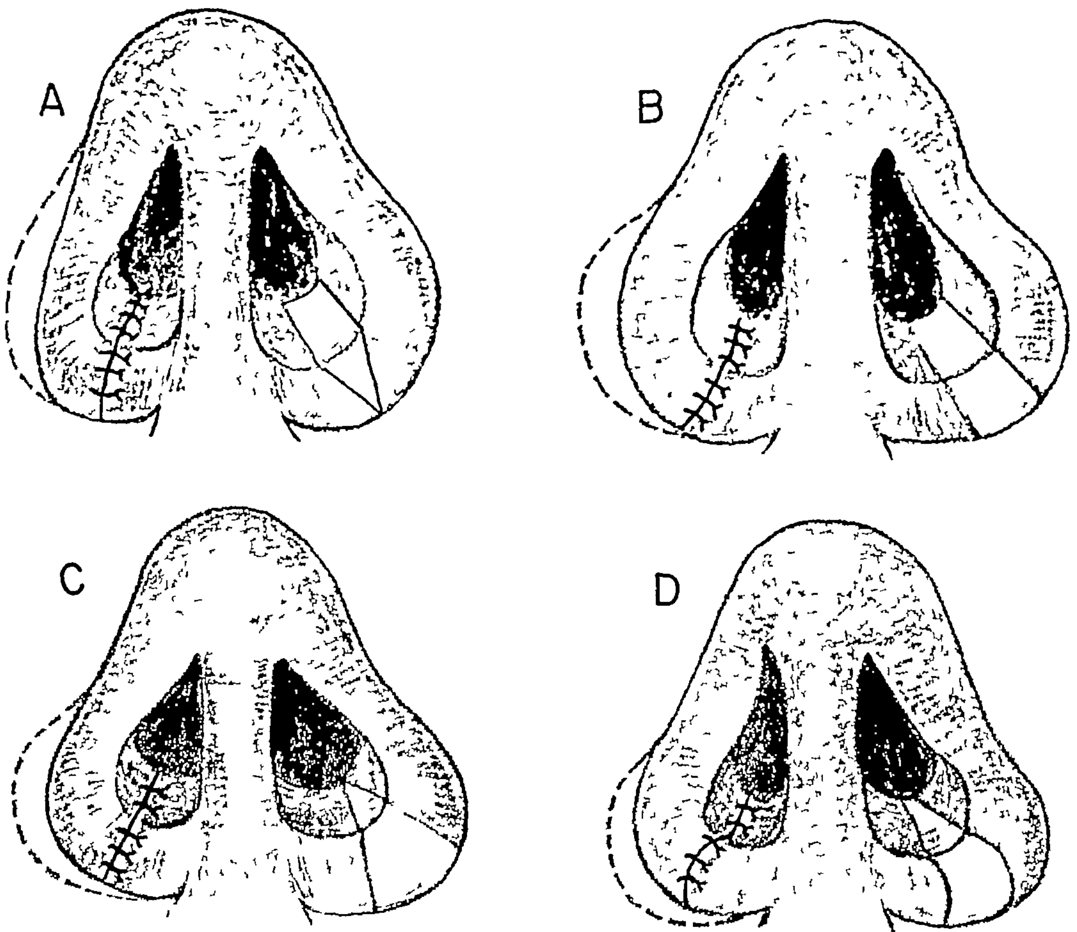


FIG 187 Illustrations of different methods for reducing the size of the nasal alae Each right side shows the tissue to be excised, each left, the effect of the completed operation

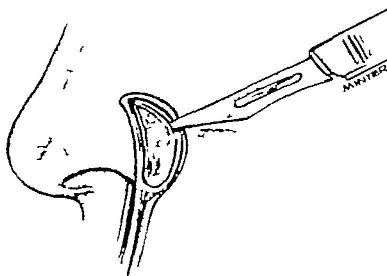


Fig 185 Fenestrated instrument outlining wedge of tissue to be excised



Fig. 186 *(Left)* Left ala of negroid nose after excision of wedge of tissue in narrowing operation *(Right)* Same after suturing with nylon 00000

the incision with interrupted horsehair sutures. Repeat the delaying process until the blood supply is adequate, then rotate the flap into the defect and fold the inferior border to produce a curved cufflike edge.

STAGE 2. Incise the skin from the lining of the margins of defect except at the base of the flap. Suture the base of the flap to the nasal lining with interrupted horsehair sutures which are passed from within outward and tied intranasally. Reflect the skin to form a rolled edge for the nostril and suture the reflected edge to the nasal skin at the tip.

Outline and elevate on the cheek a sliding flap of sufficient length to close the defect in the cheek up to the nasofacial groove; slide the flap into position and close margins with interrupted horsehair sutures.

Repair the remaining cutaneous defect on the ala with a full-thickness graft from the posterior surface of the ear. Pack the nostril smoothly with sulfathiazole gauze and cover the area of operation with sulfathiazole-petrolatum gauze (Seltzer) over which a small gauze pad is placed to cover the nose. Apply a nasal splint and fix this to the cheeks with adhesive tape. Do not disturb the dressing for from 10 to 12 days if a full-thickness graft is used. With a split graft, the dressing may be removed after from 7 to 8 days. (National Research Council.)

10. **Partial alar loss** is repaired by making a curved incision from 2 to 3 mm. above the margin of the defect. The incision is carried through to the nasal lining, but not through it. Separate the lining from the skin and beneath the nasal process of the maxilla. Incise the borders of the lining flap. This will allow the border of the defect to be lowered to the level of that of the normal nostril. This will leave a lining defect beneath the nasal process which will repair by granulation without distortion of the corrected portion. Repair the skin defect with a full-thickness skin graft from the back of the ear. Close the skin defect of the ear by undermining and suture skin edges together.

11. **Abnormally large nostrils** may result from usual breadth at the nasal tip or at the nasolabial line. In either case, a small diamond-shaped piece of skin may be excised on either the upper or the lower border of the nostrils and the opposed lateral borders sutured, the size of the openings thus being decreased (Fomon).

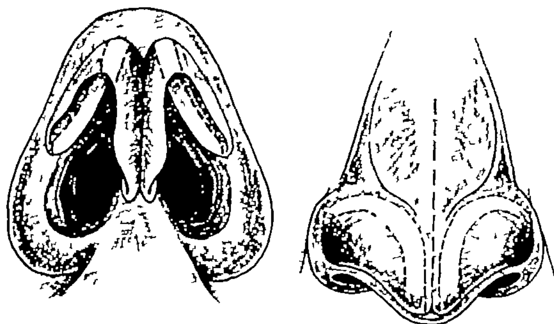


FIG. 188 *(Left)* Basal view showing section of cartilage to be removed. *(Right)* Front of tip showing architectural plan of lower lateral cartilage to be removed

the defect and the exposed ring of bone and cartilage which is to be the foundation will minimize shrinkage of the graft to be attached

With stent compound an impression is made of the subcutaneous pocket, and a Thiersch graft is taken preferably from the under side of the arm or the inner thigh This graft is wrapped round the mold with the skin surface inward and inserted into the pocket. The free edges of the graft should overlap the new margins of the alae and the columella Sutures are passed through the skin margins and over the stent mold After from 7 to 10 days the mold is removed and after sterilization is replaced to prevent shrinkage Ten days later the tissues between the original nostrils and the newly grafted pocket are excised by an irregular incision which provides a number of small flaps to which the new medial flap can be sutured by interdigitation This method avoids the formation of a contraction ring of scar tissue (G B O Connor)

9 **Total Loss of Ala** STAGE I Outline on the bordering skin of the cheek a flap of the desired size to replace both the lining defect and a rolled edge for the nostril with the pedicle bordering on the defect. Incise the borders of the flap and dissect it free but do not destroy its blood supply Return the flap to its bed and close

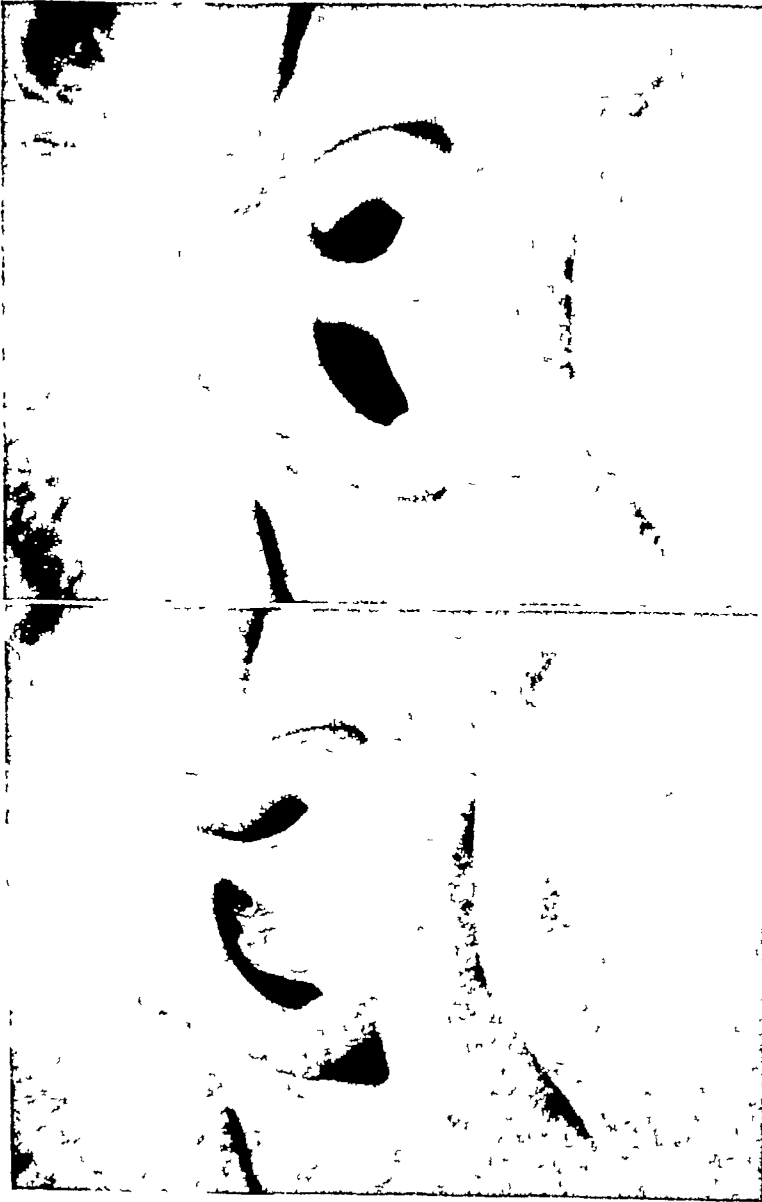


Fig 190 (*Left*) Nasal deformity from serious injury in youth, irregularity of nostrils, marked deflection of septum with obstruction (*Right*) After correction by plastic operation, submucous resection replacing septum more nearly equalizes nostrils

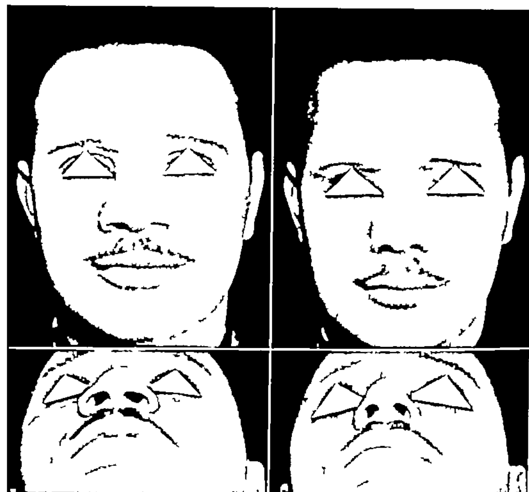


FIG 189 *(Top left)* Negroid nose in white subject before operation. *(Top right)* After correction of wide bridge and alar flattening *(Bottom)* Base of nose before and after correction by removing wedge of alar tissue leaving invisible scar

12 Abnormally small nostrils can be enlarged when they are not caused by thickened alae or wide columella, by separating the ala from the cheek along the facial fold with scissors and preparing a narrow skin flap parallel to and from 5 to 6 mm from cheek margin of the incision The separated nasal wall is placed on the denuded area of the flap and the flap is rotated inward to fill in the area from which the nasal wall was removed When both are sutured in place the nostril will have been enlarged (Fomon)

Another method is to prepare a narrow triangular flap pedicled on its base just below the nasofacial line and extending downward and outward over the lip With the lower portion of the nasal wall

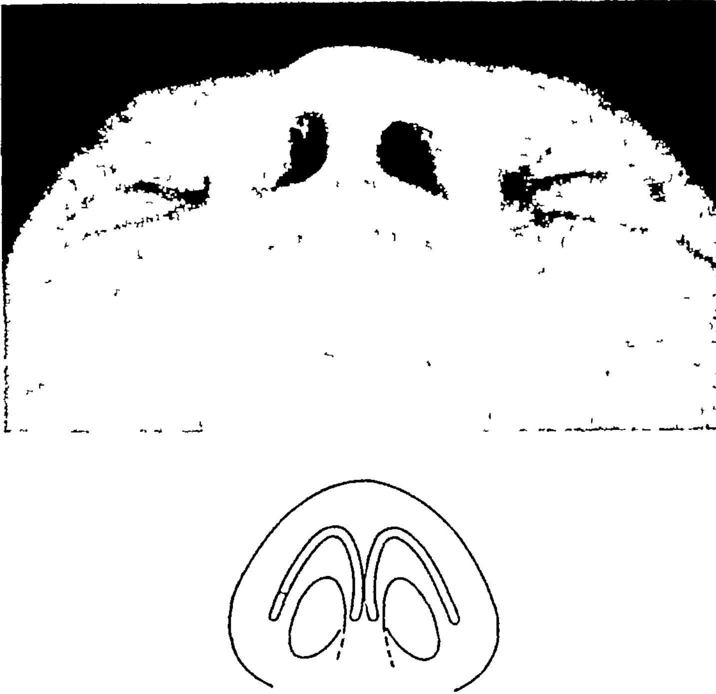


FIG 193 Posttraumatic flattening of tip accompanying saddle nose (Converse, J M Ann Otol, Rhin & Laryng 49 904)

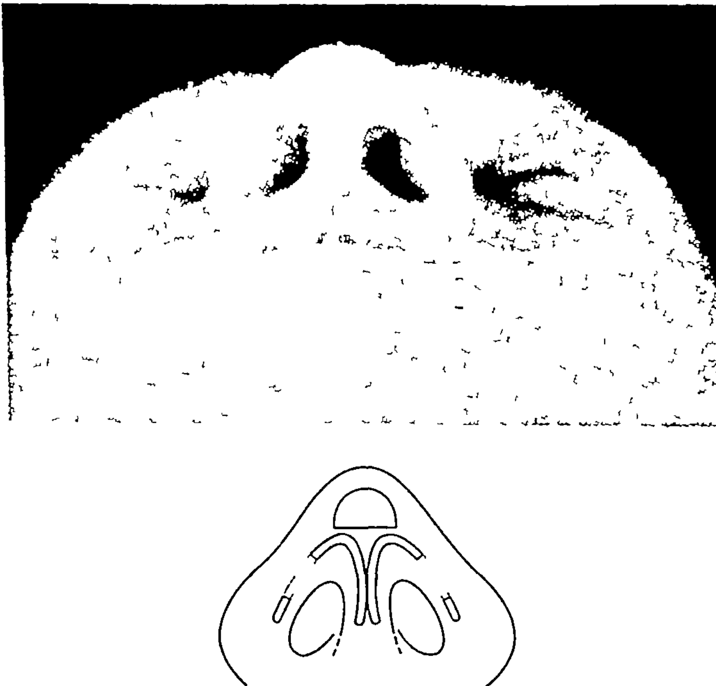


FIG 194 Appearance of tip after correction following insertion of a graft and remodeling of alar cartilages (Converse, J M, Ann Otol, Rhin & Laryng 49 904)





Fig 191 Tip presenting rounded contour following trauma. Note rounded nares. (Converse J M Ann. Otol Rhin. & Laryng 49 903)



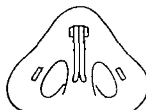


Fig 192. Result following up-and-down tip-raising operation Note change in shape of nares. (Converse, J M Ann Otol Rhin & Laryng 49 903)



Fig 197 Extremely elongated nasal tip, wide columella due to hypertrophic medial crura of the alar cartilages (Converse, J M Ann Otol, Rhin & Laryng 49 906)

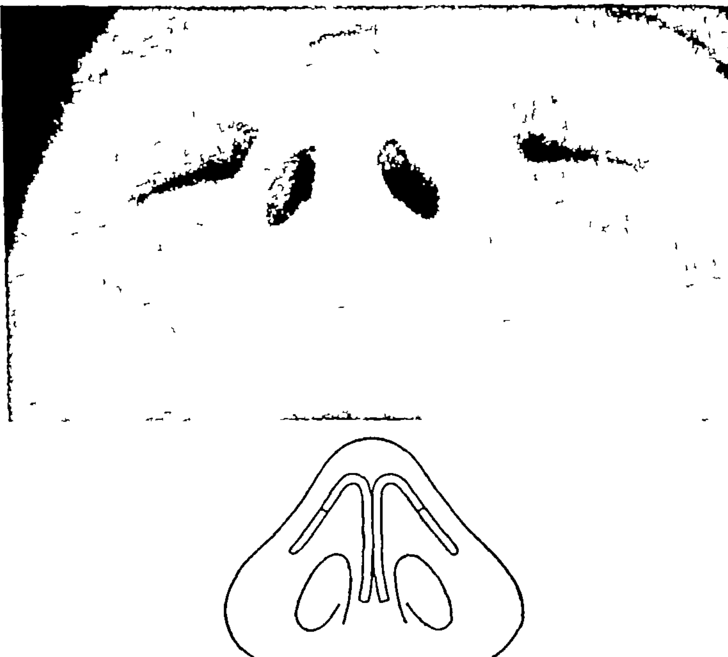
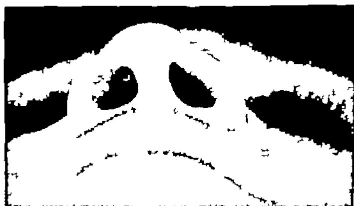


Fig 198 Appearance after resection of cartilage from the alae and from the medial crura of the alar cartilages (Converse, J M Ann Otol, Rhin & Laryng 49 906)





Fig 195 Large hypertrophic tip (Converse, J M Ann. Otol., Rhin & Laryng 49 905)



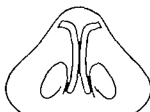


Fig 196 Appearance after operative remodeling and excision of the lateral portions of each alar cartilage (Converse J M Ann Otol., Rhin & Laryng 49 505)



FIG 197 Extremely elongated nasal tip, wide columella due to hypertrophic medial crura of the alar cartilages (Converse, J M Ann Otol, Rhin & Laryng 49 906)

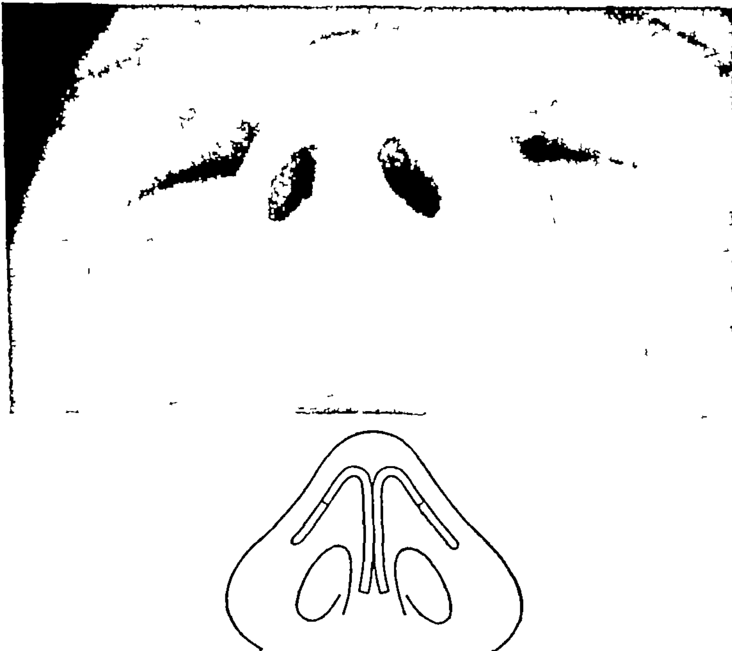


FIG 198 Appearance after resection of cartilage from the alae and from the medial crura of the alar cartilages (Converse, J M Ann. Otol, Rhin & Laryng 49 906)



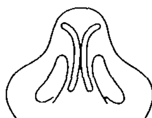


FIG. 199 Congenital absence of the lateral portion of the alar cartilages with resultant alar collapse (Converse, J M Ann Otol Rhin & Laryng 49 907)



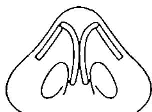
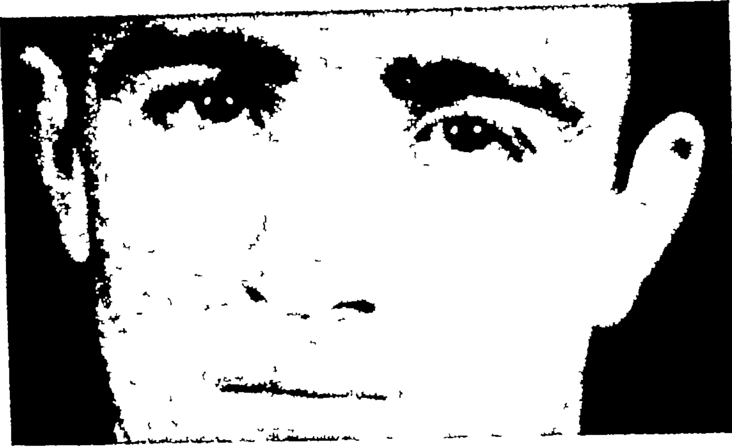
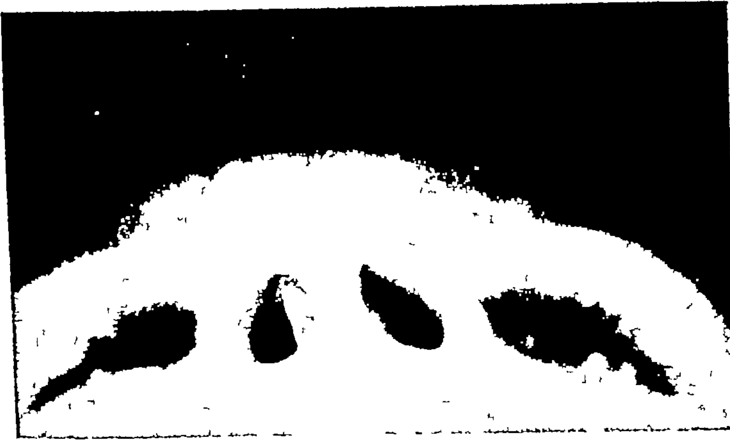


FIG 200 Appearance after cartilage grafts and tip remodeling (Converse J M Ann. Otol Rhin & Laryng 49 907)





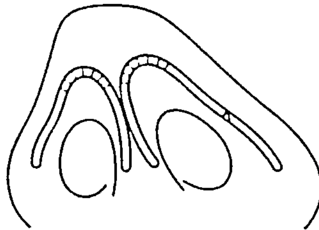
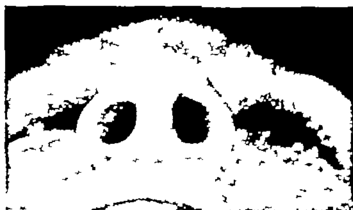


FIG 201 Asymmetrical, deviated tip (Converse, J M Ann Otol, Rhin & Laryng 49 908)

separated from the cheek, as described above, this labial flap is rotated into the incision of the nasal wall and sutured in place. After undermining the skin margins of the area on the lip, they are simply sutured together (Joseph).





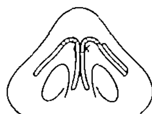


Fig 202 The case shown in Fig 201 after surgical correction. (Converse J M Ann. Otol Rhin. & Laryng 49 909)

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17

Cleft Lip

Cleft lip (harelip) is a congenital anomaly which results from the lack of union of normal lines of fusion in the face area of the developing embryo This process of fusion takes place normally at about the eleventh embryonic week

CAUSE

No single cause of cleft lip has been demonstrated. Evidently there is an influence which prevents the normal closure of the parts which are concerned A hereditary factor has been considered because the condition has appeared in more than one member of a given generation of the same family It has also been said that this defect occurs most frequently among the poorly nourished of the population but no statistical evidence has been found to support this statement. It is significant that cleft lip has been present in only one of monovular twins

OCCURRENCE

According to Davis (1924) figures which are based on more than 25 000 routine deliveries cleft lip was present in one of every 915 white births and in one of every 1 700 colored. Its occurrence was twice as frequent on the left side as on the right. The sex ratio was three in the male to one in the female

ANATOMY

Cleft lip may be either unilateral or bilateral It may also though this is rare be medial Veau reported the occurrence of 251 bilateral and 749 unilateral clefts in 1 000 cases The cleft may appear in widely different degrees There may be only a slight notching of the vermilion border or it may extend beyond into the skin surface of the lip and even more extensively upward within the nostril When the alveolar process is not cleft, but only grooved there will

still be a widening of the nostril. More marked deformity of the nose occurs when there is a definite cleft between the maxillary surfaces, which causes a cleft in the floor of the nostril and involves also the musculature. The involvement of the nose, which is always present with cleft lip, appears as a widening of the nostril on the affected side with flattening and lowering of the alar rim. Considerable deformity of nose and lip may exist if the alveolar cleft is wide The ala on the affected side is stretched and flattened. The fibrous tissue is also stretched and the lower lateral cartilage is thinned out, dislocated and rotated downward There may also be deflection of the cartilaginous septum with dislocation from its attachment to the anterior nasal spine The premaxilla may be deflected outward with inward rotation of the maxillary border of the cleft.

WHEN TO OPERATE

Operation should be done early if possible, as soon as the infant has made up its initial loss of weight. Operation should not be performed in the presence of any infection, nor if the infant is dehydrated or poorly nourished Immediate operation is not necessary (Ivy, 1946)

Early correction is desirable, however, on account of both parents and child For the former, there is relief from an unpleasant emotional situation, and particularly for the latter, a feeding difficulty is removed and the possibility of respiratory infection is lessened There is also the benefit derived from early correction in which the parts tend to assume more nearly normal relations than when more prolonged growth has increased the degree of distortion of the various tissues concerned

Blair points out that the nose must be brought into the midline in order to maintain the proper position of the bridge during the period of its growth, and that the normal relation of the labial angle of the columella to the lateral end of the ala is equally important

The exact time may best be chosen during the period from birth to three months of age, but the final decision must rest in each case on the child's physical condition and the judgment of the operator.

PREOPERATIVE MEASURES

The same care and preparation as are used in major surgical procedures should be observed in operating for cleft lip Blair and

Ivy consider special preparation for this operation unnecessary if the infant is in good health They advise feeding up to two hours before beginning to operate

Fomon emphasizes that the patient should be examined carefully and that blood typing and arrangement for donor are advisable. He also advises operating in spring or summer preferably For older children he considers it an advantage to admit them to the hospital a few days before operation so that they may become familiar with the surroundings

There is general agreement that careful study of the condition to be corrected is of the greatest importance and that all the required operative steps should be determined before the final surgery is undertaken Lamont favors making a plaster cast for preoperative study

OBJECTIVES

Vaughan enumerates the desired results as

A straight columella.

A well-curved ala and nostril

Each side of the nasal tip the same height.

The floor of the vestibule on the same level on each side

The nostril on the reconstructed side exactly as on the opposite

The upper lip extending normally forward beyond the lower with a complete vermilion border

The same author warns against

The flattening of both ala and nasal tip

Angulation of the ala

Depression of the vestibular floor

A difference in size and shape of the nostrils

A flattened contour of the upper lip which results from too great lengthening from above downward in relation to the side-to-side shortening with a short inverted vermilion border

INSTRUMENTS

Obviously the choice of instruments must be determined finally by the requirements of the operator As a list for general use Fomon suggests the following

Carefully sharpened knives of cataract type and of various shapes.

Forceps—plain dissecting straight and curved

Veau's twin needles mounted with points 2 mm. apart
Hemostats—straight and curved.
Needles—Reverdin, straight and curved.
Small dural hooks
Fine ophthalmic silk in atraumatic needles, horsehair in cambric needles
Lip clamps
Suction apparatus
Calipers with sharp points

THE OPERATION

Each operation must be adapted to the requirements of the subject This point is emphasized by Dorrance, who says that "each man makes his own modification, even if he does not realize it" Barsky, who has specialized on cleft lip, has concluded that there is no one single procedure that will correct every lip satisfactorily Aufricht adds that all one can do to the embryologic defect is correct it, knowing that the result cannot be predicted Ovens stresses the importance of obtaining symmetry of the nostrils, and this should be secured in the beginning, since the lip can be repaired properly afterward, but the nostrils cannot be satisfactorily reconstructed after the lip repair has been completed.

One point on which there appears to be some difference of opinion is whether the cleft in the maxilla should or should not be wired in its repair The sum of opinion appears to be that in the young infant this is unnecessary, that the pressure of the sutured lip will hold these parts in position, and that denudation of the maxillary margins is all that is required For older subjects, however, it may be desirable to close the cleft by wiring the opposed parts of the maxilla, using particular care that the wire does not pass through the centers of growth of the teeth, which would be disturbed in consequence The final decision of this question, as of others, must be the responsibility of the operator

Blair and Ivy emphasize one general rule, that the intermaxilla should never be removed, either in single- or in double-cleft lip, but pressed as nearly as possible into normal relations, especially so that the denuded borders of the cleft will be in contact The intermaxilla should not be pressed backward too far or a flat lip will be the result.

Ivy consider special preparation for this operation unnecessary if the infant is in good health They advise feeding up to two hours before beginning to operate

Fomon emphasizes that the patient should be examined carefully and that blood typing and arrangement for donor are advisable. He also advises operating in spring or summer preferably For older children he considers it an advantage to admit them to the hospital a few days before operation so that they may become familiar with the surroundings

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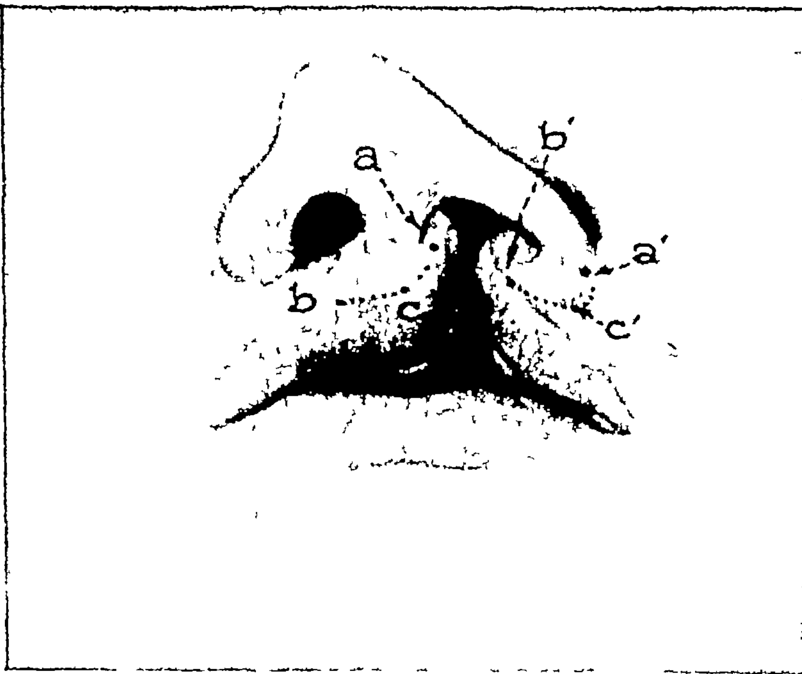


Fig 203 Blair-Brown technic for repair of complete unilateral cleft lip Plans of repair based on original Mirault operation Points a, b, c, and a′, b′, c′ are pricked with pin or needle, using methylene blue Point a is placed on mucocutaneous junction immediately above point at which line corresponding to oblique base of columella would intersect the vermilion Usually in complete cleft of lip, there is a slight shallow notch in skin at this point Point b is placed where ridge that bounds philtrum on opposite side meets mucocutaneous junction, c is at point halfway between a and b While it was stated that points a, b and c were placed in the mucocutaneous line, in practice they are placed within skin border, so that, when incisions are made, marks will remain visible as guides in placing sutures In partial cleft, a is located on inside of defect of lip instead of along mucocutaneous junction, which, in this instance, does not extend up as far as this

On outer side of cleft, a′ is put immediately beyond point of ala By drawing lip downward and outward, exact point where ala joins lip will become visible Placing of point c′ requires careful consideration It should be under and internal to a′, and at a *vertical distance from vermilion* border equal to vertical distance between b and c Point b′ is on mucocutaneous line at a distance from c′ equal to bc Distance from a′ to c′ must be equal to or less than distance ac′, but if a′ c′ is less than distance ac, cut is brought to proper length by making it curved (May, Hans Reconstructive and Reparative Surgery, Philadelphia, Davis)

When there is marked protrusion and rotation of the premaxilla (intermaxilla) David (1943) prefers not to excise any part of the vomer unless it is absolutely necessary since the result may be an unduly movable premaxilla If the protrusion is such that the closure of the clefts in the lip is not possible he splits the vomer into two laminae and separates these layers by pressure in this way shortening the vomer anteroposteriorly

Where there is bilateral cleft of both lip and palate Ivy (1946) does a two-stage operation at an age of six weeks to three months with an interval of about a month He advises against separating the premaxilla from the surrounding bone and cartilage since it is apt to go backward too far and be rotated so that a flat upper lip results. He has found that a later secondary operation is often necessary to correct further the contour of lip and nostril that bilateral cleft lip is particularly apt to be accompanied by a short columella with consequent depression of the nasal tip This condition can be corrected later by introduction of the skin of the midportion of the lip into the columella to give it added length

OPERATIVE TECHNIC

As a general guide one technical procedure (Vaughan) is presented which can be adapted to meet the need of the individual case of unilateral cleft lip

1 Separate the ala thoroughly from the maxillary side of the cleft and continue undermining under the columella the cartilaginous septum and well under the ala of the normal side.

2 Split the flattened ala along its inferior border passing the incision along the vestibule within the junction of the skin and lining membrane at the alar-columellar angle.

3 Separate the tissues between the skin and the inner membrane continue undermining over the tip including the ala of the opposite side Use particular care not to excise any of the lining membrane within the vestibule to avoid contraction of the nostrils.

4 Using calipers, measure the distance between the outer angle of the ala and the vermilion border on the normal side. Record this measurement and mark along the inner border of the cleft from the base of the columella to the vermilion border With the knife just within the skin border incise between these points turn the flap forward and slightly undermine the skin With the calipers,

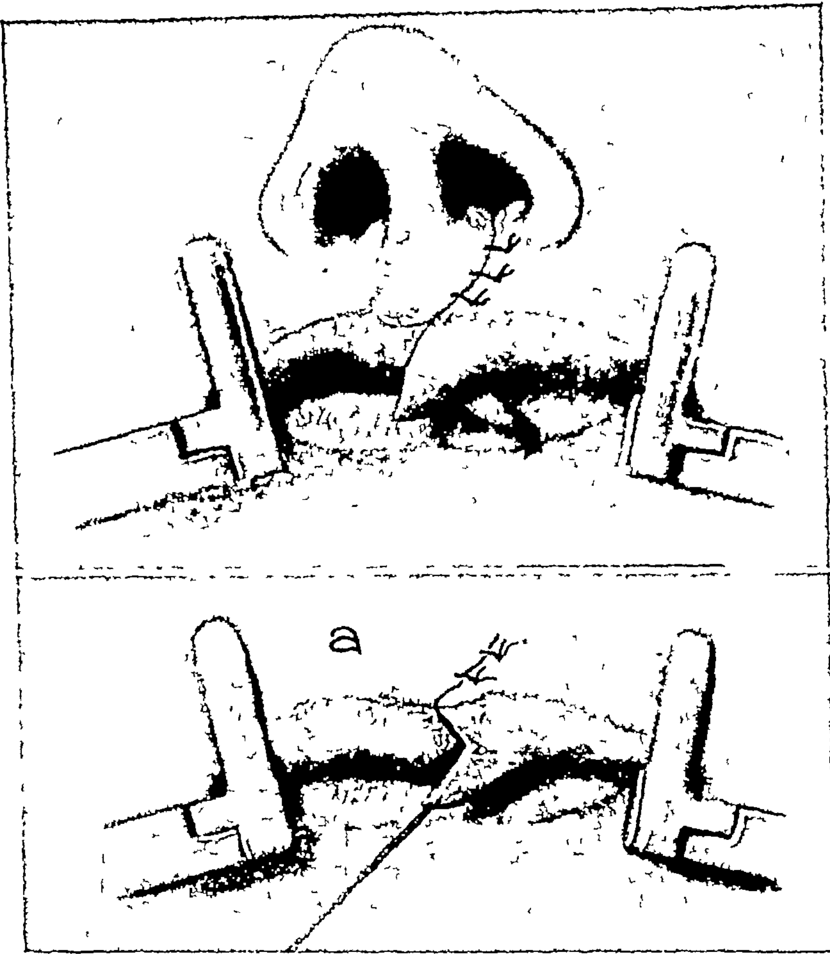


FIG 205 To avoid notching of lip, shortened vermilion border flaps are incised as shown in lower drawing Lateral flap is split through entire thickness of vermilion, and pointed median flap is fitted into this cleft (May, Hans Reconstructive and Reparative Surgery, Philadelphia, Davis)

tissue can be removed by subcutaneous incision without including any of the vestibular lining Separating the skin and the lining of the vestibule elevates the flattened ala and produces a convex line when the labial end is turned in and sutured This elevation is maintained and the lining reapproximated by bending a mattress suture splint of thin silver so that it fits the upper portion of the nostril. If desirable, a small piece of tissue can be excised from the inner margin of the lower border of the ala A mattress suture may be passed through the septum from the normal nostril, through the repaired ala, if necessary, to assure the desired position of the ala in relation to the columella A Logan bow is then applied

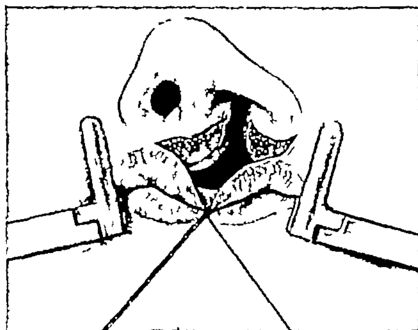


FIG 204 Application of elastic clamps to control bleeding Incisions carried out along lines marked. Formation of vermilion border flaps (May Hans Reconstructive and Reparative Surgery Philadelphia Davis)

then measure the distance between the lower margin of the ala and the prominent mesial end of the vermilion border on the outer side of the cleft. Incise between these two points by an incision curved so that its length shall be about the same as that on the mesial side of the cleft. Turn the flap upward and undermine the skin Turn the ala in and unite with the base of the columella by a suture making sure that the level of the ala is the same as that of the opposite side The vermilion borders are then united with their junction with the skin and the external and internal surfaces are sutured The vermilion borders are sutured with the V-shaped section fitted into the notch on the distal side

5 Suture the excess tissue on the alar side to the base of the columella to form the nasal floor

The repaired nostril may be made somewhat larger than the normal one to allow for contraction and pull of the repaired lip which usually close the alveolar cleft and thus narrow the nostril A larger nostril can be corrected more easily than a smaller one

6 If turning in the ala to shape the nostril causes a ridge of redundant tissue to project into the nostril on the alar side this excess



FIG 208 Cleft Lip (*Left*) Before operation (*Right*) After operation (Wolf, G D Ear, Nose and Throat, Philadelphia, Lippincott)

BILATERAL CLEFT LIP

For the repair of bilateral cleft lip, David (1943) has found that the entire philtrum can be used to advantage in closing the clefts, in a two-stage operation, with an interval varying from eight months to two years

The first step is done in the normal infant preferably between three weeks and three months of age Incisions are made through the entire thickness of the lip, following along the alar fold and extending to the lip cleft, with lateral undermining of the skin well out upon the cheeks The corresponding margins of the clefts and flaps are then brought together and sutured, completing the first stage The gradual lateral traction exerted in this way on the philtrum causes an increase in all its dimensions, so that it assumes a nearly normal central segment of the lip

The aim of the second step in this procedure is to bring the lateral fullness present on the free edge of the lip into the free margin of the philtrum in the manner of single pedicle flap inlays, To effect this part of the operation, a vertical incision is made into the lip about 1/6 inch in depth In this way, a recess is formed between the skin and the mucous membrane surfaces, into which the flaps with vermilion surfaces are placed The ends of the flaps are then sutured together in the midline and the flaps are then sutured to the margins of the skin and of the mucous membrane.

This method has been found to avoid successfully the transverse

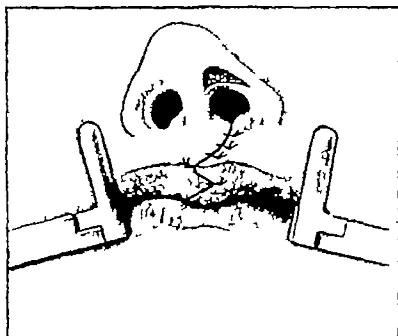


FIG. 206 If nostril is flat crescent-shaped piece of cartilage is removed from columella alar angle followed by trimming and closure of skin. (May Hans Reconstructive and Reparative Surgery Philadelphia Davis.)

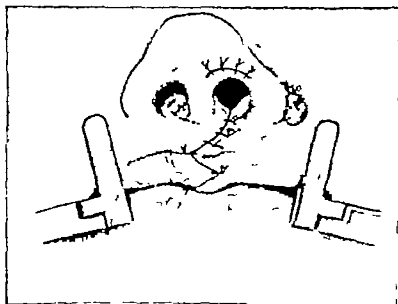


FIG. 207 Nostril retention suture consisting of mattress suture through floor of nostril It is tied over small lead plates at base of nostril and other side of columella. (May Hans Reconstructive and Reparative Surgery Philadelphia Davis.)



FIG 208 Cleft Lip *(Left)* Before operation *(Right)* After operation (Wolf, G D Ear, Nose and Throat. Philadelphia, Lippincott)

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This method has been found to avoid successfully the transverse

tension which sometimes results from other technics The advantages presented for this method are

Absence of tightness of the upper lip
Improvement in control of the length of the lip
More satisfactory floor of the nostrils.
More philtrum tissue is available for elevation of the nasal tip if needed to lengthen the columella

These methods are presented as suitable only for primary operations. Secondary reconstruction of earlier unsuccessful operations must in every case be considered individually depending upon the requirements of each case It may be necessary to recreate the original cleft condition and proceed from that point by removing any excess of scar tissue

POSTOPERATIVE MEASURES

The importance of after care is emphasized by Ovens who recommends the use with infants of arm restraint until the wound is healed Two hundred and fifty cubic centimeters of isotonic saline are given subcutaneously and the infant is kept in the Trendelenburg position until consciousness has been re-established.

The wound should be cleansed as often as indicated with hydrogen peroxide Sulfanilamide powder is blown over the operated field and a mixture of balsam of Peru (1 part) and castor oil (4 parts) is applied to prevent the formation of firm crusts A Logan bow is applied and kept in place for five days.

Water is given by mouth on the first day and the regular formula may be used thereafter

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18

Postoperative Complications

In operations on or about the nose as great care as is exercised in other fields of surgery is necessary to avoid undesirable and sometimes serious postoperative complications. The responsibility for such unsatisfactory results must rest upon the operator in every case.

Complications following operations on the nose are due to three principal causes

1 Infections (a) local (of the operative field) (b) local (at a distance) (c) general
2 Injury
3 Nervous reactions.

INFECTIONS

Lack of care in maintaining strict asepsis throughout the operative procedure is the commonest cause of infection following operation. However postoperative infections are not exclusively due to lack of care since the operation may act as an exciting cause of an already existing inactive condition but have no other relation to the postoperative complications This relationship is more clearly evidenced in the findings which indicate that the incidence of infantile paralysis (acute anterior poliomyelitis) often has a direct relation to tonsillectomy

Local clinical symptoms such as eruptions abscesses and erysipelas may appear on or near the nose externally while internally there may be such conditions as postnasal discharge and coryza

At a distance there occur headache backache nausea and vomiting sinusitis, otitis media cough which may or may not be associated with pneumonia and in the writer's own experience infectious mononucleosis and other infectious states.

The possibility of the appearance of severe infectious symptoms demands the closest observation by the physician of the patient following nasal operation In case of the appearance of a rise of tem

perature, the situation becomes at once one of internal medicine and must be treated as such, with consulting assistance if the patient's condition suggests the need.

The most common source of infection is always lack of care in maintaining a sterile field. This condition arises from inadequate sterilization of instruments and of all materials used for the operation, and from insufficient cleansing of the skin surfaces and of the nasal cavities. Bone fragments are sometimes introduced into the incision, and bits of gauze or cotton fibrils which may catch on a saw. Other sources of infections to which it would seem hardly necessary to call the attention of a surgeon, but which do still exist, are neglect to remove all the packing or gauze sponges which have been introduced and may be later overlooked. All these materials act as foreign bodies and as centers for the growth of bacteria in surgery about the nose.

Grafts. The introduction of improper grafts and lack of care in handling them with the hands instead of with sterile instruments will be a source of infection. Among other results of infection is abscess of the septum, followed by breaking down of the cartilage with a saddle nose the outcome

INJURY

Injuries may be caused by lack of sufficient care in operating, with the consequent appearance of such manifestations of accumulations of blood as ecchymoses or, more severely, hematoma To avoid the latter condition, careful hemostasis should always be secured at the time of operation, and all clots or collections of blood beneath the skin should be carefully expressed Collections of blood under the periosteum may cause stimulation of osteoblasts and deformity from consequent bone tumor

Mechanical injury to the nose immediately after operation often causes deformities from disturbance of the carefully adjusted parts Too frequent postoperative dressing will cause unnecessary movement, with possible extravasation of blood or serum or the dislocation of such structures as the lower lateral cartilages

If molds (splints) used for the dressing are not properly fitted and are applied to the nose, necrosis of the delicate regenerating tissues may be caused by too great pressure All postoperative care should be given by the physician If applying a splint is delegated

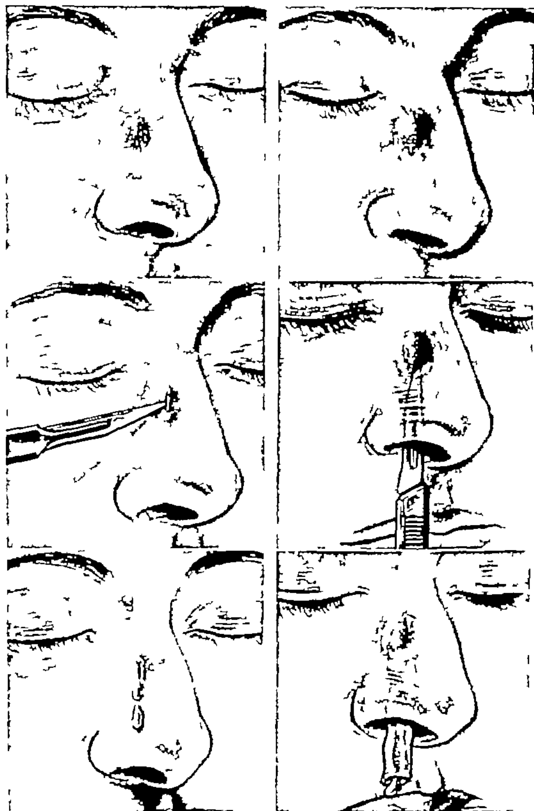


FIG 209 *(Top left)* Infection following nasoplastic operation or cartilage implant *(Top right)* Same infection *(Center left)* Surface incision no anesthesia with Bard Parker No 11 knife *(Center right)* Intranasal incision local 4 per cent cocaine anesthesia *(Bottom left)* Pus exuding resulting scar minimal may be invisible. *(Bottom right)* Intranasal rubber cigarette gauze drain no scars.



FIG 210 *(Left)* Proper position of the saw in removal of hump *(Right)* Wrong position allows the last tooth of the saw to catch in the subcutaneous tissues or in the periosteum

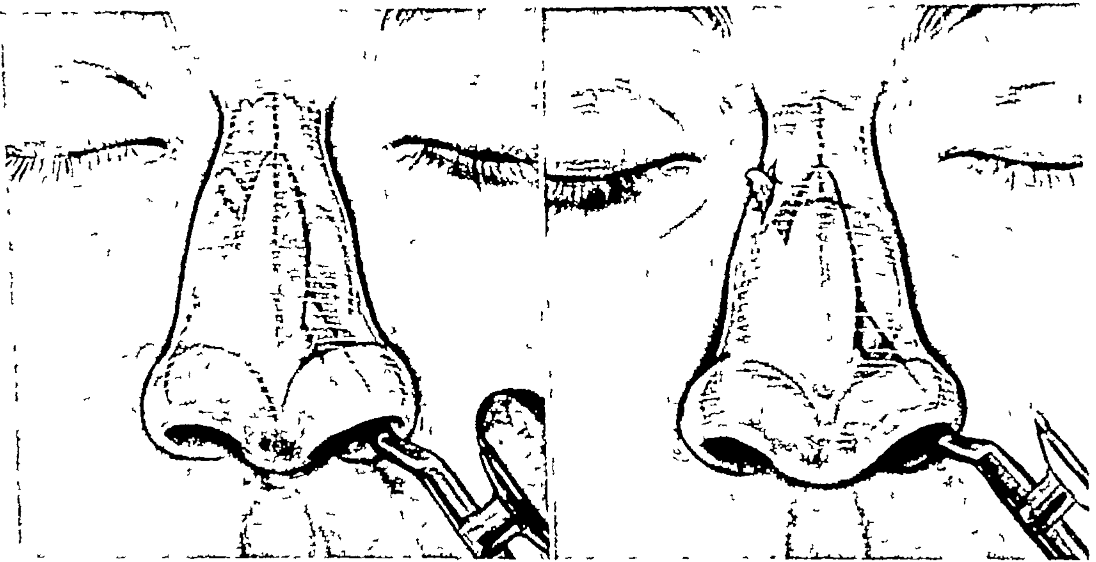


FIG 211 *(Left)* Proper position of saw *(Right)* Lack of care by the surgeon or movement of the patient causes penetration of the tissue (See illustration of saw guide)

to the patient, his choice may be faulty and a brace which is too narrow for the nose or which causes unbalanced pressure will lead to nasal deformity

Accidents also occur for which the operator is not immediately responsible, through, for instance, the handling by the patient of the freshly operated nose, through his colliding with heavy objects

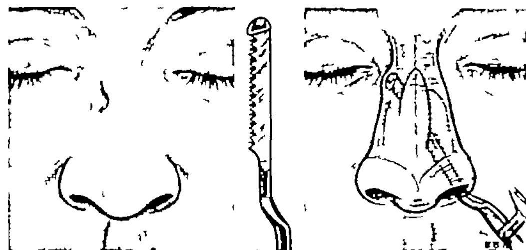


FIG 212. *(Left) Injury of tissues from catching of saw with destruction of blood supply and resulting adhesion which cannot be remedied by massage or manipulation* *(Right)* Author's design for attachment to end of saw to prevent injury

or falling while in the hospital Unusual but preventable accidents should also be anticipated as for instance, burns of the freshly operated nose as a result of bandages and dressings catching fire from the patient's smoking This has occurred on the writer's hospital service.

The patient should always be instructed that any injury to the nose, even though not severe should be reported immediately since even slight displacement of the parts as of the nasal bones or cartilages may go on to a later marked deformity

If the tip of the nose has been lifted, the patient should be made clearly aware that a drop will occur in the course of a certain length of time This is important because otherwise if he considers the tip of the nose too high he may decide to massage it and as a result will in time be apt to discover that the tip has dropped too low and that *a second operation is required to replace it as it would have* been if left alone

NERVOUS REACTIONS

In considering the nature of manifestations that may appear to be of nervous origin particular judgment must be exercised to make sure that they are not actually physical as many may also represent infections. These are most commonly headache backache or other feelings of vague discomfort that may cause complaint. Nausea

vomiting, flatulence and retention of urine may also be classified under either heading. Too much emphasis cannot be put on the importance of differentiating between the organic and the functional origin of all such conditions More clearly nervous symptoms are found in restlessness, extremes of mood, irritability, fault-finding, demands for special attention and similar reactions.

These complicating conditions and others that are seen directly following surgical operation demand immediate and effective care, whatever their nature.

A question, finally, of considerable significance for the postoperative success of any operation is that the patient follow conscientiously the directions given for returning for later care Sutures must be removed at the proper time to avoid a risk of fibrosis or other tissue hyperplasia Dressings must be renewed according to the existing indications and removed according to the judgment of the surgeon, and for these measures the co-operation of the patient is absolutely essential.

19

The Unsuccessful Operation—Its Causes and Prevention

Only the exercise of critical foresight, together with technical skill can assure success in operations on and about the nose It is true as every rhinoplastic surgeon recognizes that the operator must also be something of an artist and a sculptor with an eye for line and form However for the success of an operation he must first of all be a well trained surgeon with an adequate knowledge of anatomy physiology and pathology since the subject of the operation is not one of canvas and paint of stone or metal but of living tissue which follows definite laws in reacting to given influences. These reactions vary depending upon a large number of special factors, such as race (tendency to keloid growth in the Negro) age (with its alterations in metabolism which are manifested in tissue healing) the immediate state of health (nutrition diabetes etc.) and particularly the response of different types of tissue—muscle fibrous tissue bone cartilage—to injury or to surgery and their reparative processes.

From the technical viewpoint alone the beginner should have had ample experience in observing the methods of practiced operators together with repeated opportunities to assist in these surgical procedures. Preparation in this way will help him to avoid trial and-error methods and to lessen serious results for both himself and his patient. This point can hardly be overstressed, and lack of success can be reduced to the two main essentials (1) Inexperience (lack of technical knowledge) (2) inadequate preoperative analysis (inability to judge the exact requirement of the given situation)

The beginner may not recognize the need for exceptional care in handling the tissues during operation and for exactness and delicacy in the use of instruments to avoid such accidents as skin perforation. Perforation can easily occur even during the removal of too

much subcutaneous fat and may result later in scars and retractions. Also, a sufficient amount of fat underlying the skin is necessary to maintain an adequate blood supply and so avoid necrosis of the area involved

The possibility of "improper tissue traction" or of adhesions is often given little or no consideration A point about tissue shrinkage that is worth remembering is that in an unusually large nose and in subjects more than 50 years of age, tension is much less than in the young Not infrequently, tissue relaxation rather than shrinkage may occur, and a secondary operation may be required to correct a drooping tip which has resulted from such relaxation of the nasal tissue following the original operation Consideration of the nasal mucosa in relation to tissue retraction (shrinkage) is also important, since its disturbance or removal can result in severe nasal deformity caused by the contracted tissue surface

Other common technical mistakes are

1 Failure to remove the same amount of tissue on both sides of the nasal bridge in reducing a hump This will leave an irregularity of the dorsal line

2 Inaccurate leveling of the dorsum, which also creates an irregularity of the dorsal surface.

3 Removal of too much of the lower lateral cartilages and lack of their exact approximation which will produce other unsightly ridges and depressions in the nasal contour

4 Cutting through the nasal muscles overlying the periosteum or destroying their nerve supply, which causes a fixity of expression or "plastic appearance" about the nose When muscles must be incised, the incision should follow the lines of Langer to assure a good result

5 Removal of only the bony parts which immediately form a hump nose, which will result in an unsuccessful operation, since the result will be a flat dorsum An outstanding law of plastic surgery should be no matter how small the hump that is removed, *the nose must be narrowed* A warning is timely that if, in this narrowing nose, the superior maxillary processes have been only partly cut through instead of being completely divided, and their borders are approximated in the mid-dorsal line by pressure, they may tend to return to their original positions if the proper degree of fracture has not been made.



FIG 213 (*Left*) Nose after incomplete removal of hump (*Right*) Same nose after reparative correction

6 Removal of a hump by filing or rasping, which never gives a satisfactory result. It should be specially emphasized that a hump of any size should be removed with the saw, rather than by being filed off, as is sometimes done

7 Failure to remove, when operating for hump nose, a small bony web at the root of the nose between the upper extremities of the nasal bones, or there will be too great width. This strip of bone can be chiseled out by using a long blade on each side of the web, when it can be drawn out with hemostatic forceps. After the part has been removed, the fractured nasal bones can be brought close together

8. Failure to secure sufficient hemostasis and injury to the vascular bed, which allow the blood elements to penetrate the surrounding tissues, particularly the tissue which is more loosely constituted, below the eyes, with a possible resulting permanent pigmentation of the skin of the lower eyelids

9 Failure to correct deviation of the septum before narrowing a bridge, otherwise nasal obstruction will persist

10 Displacement of the columella if not properly sutured

11 Some degree of nasal obstruction if the septum is shortened without shortening the upper lateral cartilages at the same time, as shortening of the septal cartilage will cause them to project into the nasal passages

12 The loss in removing a hump of the fragment separated It has happened that only later, when the patient complained of a swelling on the tip of the nose, this piece of bone was removed from beneath the skin, where it has slipped at the time of the operation

Other postoperative failures, which result from inadequate preoperative planning and from lack of esthetic judgment in the operator include

1 Failure to take the other facial features into consideration, and to make a correction of the nose that will be in harmony with them

2 Removal of a hump without remodeling the tip, to avoid the so-called bird face

3 Not allowing the septum, in narrowing the nose, to project suitably above the lateral walls, to obviate the presence of sharp edges on either side of the dorsum



Fig 214 (*Left*) Nasal deformity from accidental injury with projection of bone distortion of cartilage (*Right*) Deformity corrected and entire nose reduced in size

4. Not making the lateral walls of equal width If unequal, there is an asymmetry of the dorsum with the effect of nasal deviation

5. Not making a smooth cut with the saw in sawing through the superior maxillary process in which case step-like ridges appear when the operation is completed

6 Overdoing the narrowing of the tip of the nose and so giving it a pinched-in appearance

7 The deformation of the nasal tip by the removal of too much tissue from the medial crura, which will destroy the necessary support and the tip will become depressed

8 A retracted tip and a distorted columella from the removal of too much tissue from the lower border of the septum

Esthetic judgment is particularly necessary in all operations in the region of the nares·

1 A large amount of vestibular skin should not be removed, since atresia will follow.

2. Special care is needed in narrowing the lower aspect of the nose to assure a perfectly symmetrical result so that the contour will be the same on both sides

3 The securing of a proper nasolabial angle is often neglected To obtain a successful result, the anterior inferior nasal spine should be removed and the parts properly sutured in place by the use of an Aufricht submerged suture

4 If the columella is to be narrowed, injuries to the skin surfaces can be avoided by using a Seltzer nasal tissue clamp

5 If there is a hanging columella, which may be present either because of too great length of septal cartilage or of an excess of vestibular skin, the amount of tissue excised should make the sides finally symmetrical

Distortion of the nose may be caused by the overlapping of tissue instead of careful approximation of borders of the incision

The question of scar tissue is always significant, and especially as it concerns the hyperplasia of keloid tissue The writer has had two instances of keloid growth following operation below the nares

To avoid scars when narrowing the wide base of the tip, incisions should always be made within the nasolabial folds

In general, success depends on careful preparation Poor planning means taking a chance Preparation begins with taking a

careful history Questions should specially include the subjects of any previous operations about the nose including paranasal-sinus disease syphilis lupus allergy (hay fever) rheumatic endocarditis (emboli) eczema about the nares and other relevant conditions. Physical examination is important and has already been considered It should include blood tests urinalysis (including test for sugar) making photographs a mask etc. If the patient wears false teeth—particularly an upper plate—they should be worn during the examination and also during the operation so that their effect upon the contour of the nose may be seen

However fully precautions and rules for preparation and technic may be detailed the most important factors to success are observation and experience

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